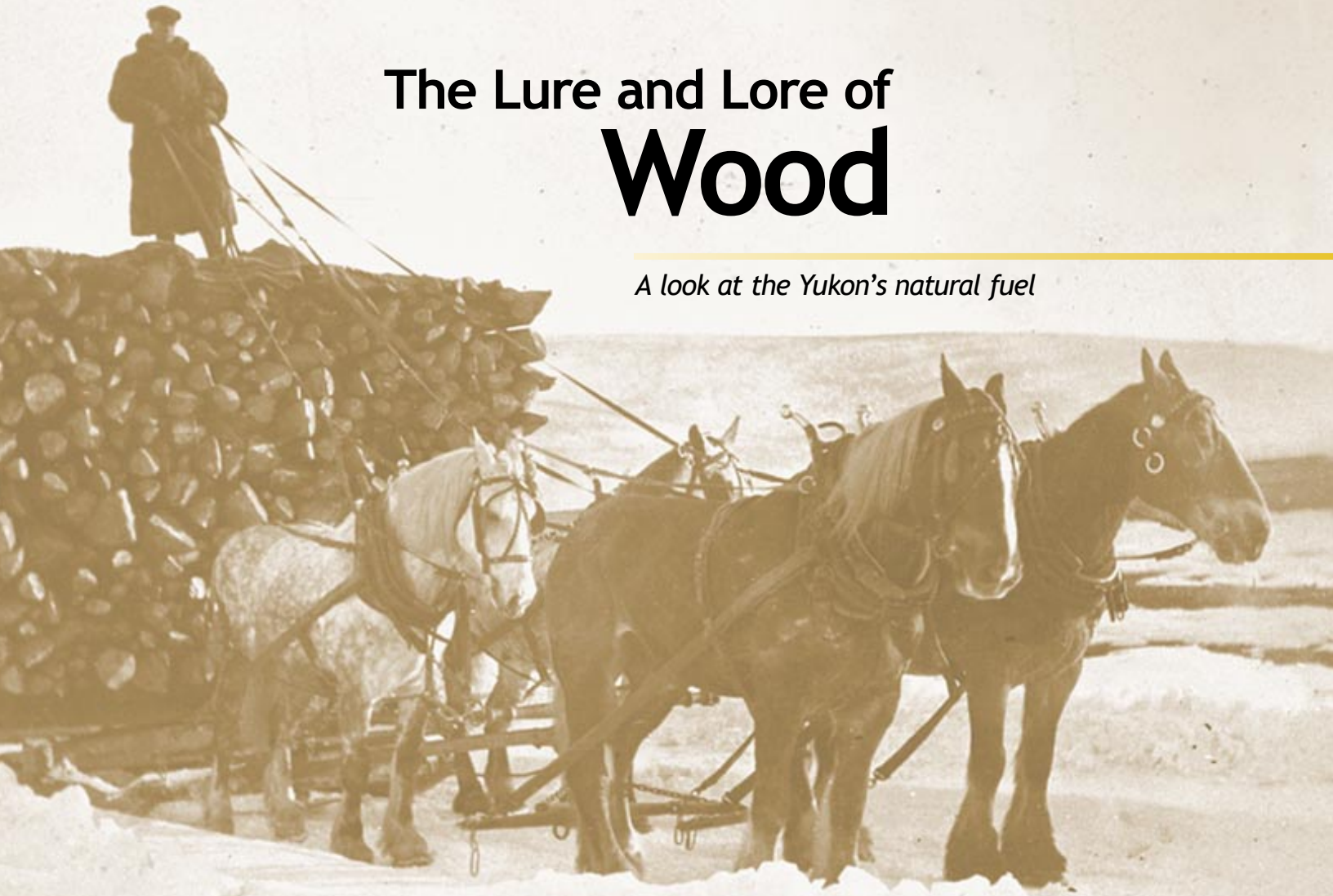
The Lure and Lore of Wood

A look at the Yukon's natural fuel



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YUKON ENERGY

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Burn it Smart

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WOOD ENERGY

Sunlight travels 93 million miles to reach this planet and the sun's energy is the basis of biological life here on earth. While much of this energy bounces off the atmosphere back into space, some of what gets through to the earth heats the ground and atmosphere and is stored by vegetation.

Plants, such as trees, grow using solar energy, nutrients and minerals from the soil, and carbon dioxide from the atmosphere. The oxygen they produce as a by-product of photosynthesis supports other forms of life on the planet.

When wood burns, energy stored as carbon by the tree combines with oxygen from the atmosphere in a chemical reaction that produces heat, light and carbon dioxide. Fire also releases other minerals and nutrients that were taken in by the tree when it was growing, reversing in minutes the long process that led to the growth of the tree.

Boreal forest

Boreal forest ecosystems cover 35% of Canada's land area, including much of the Yukon.

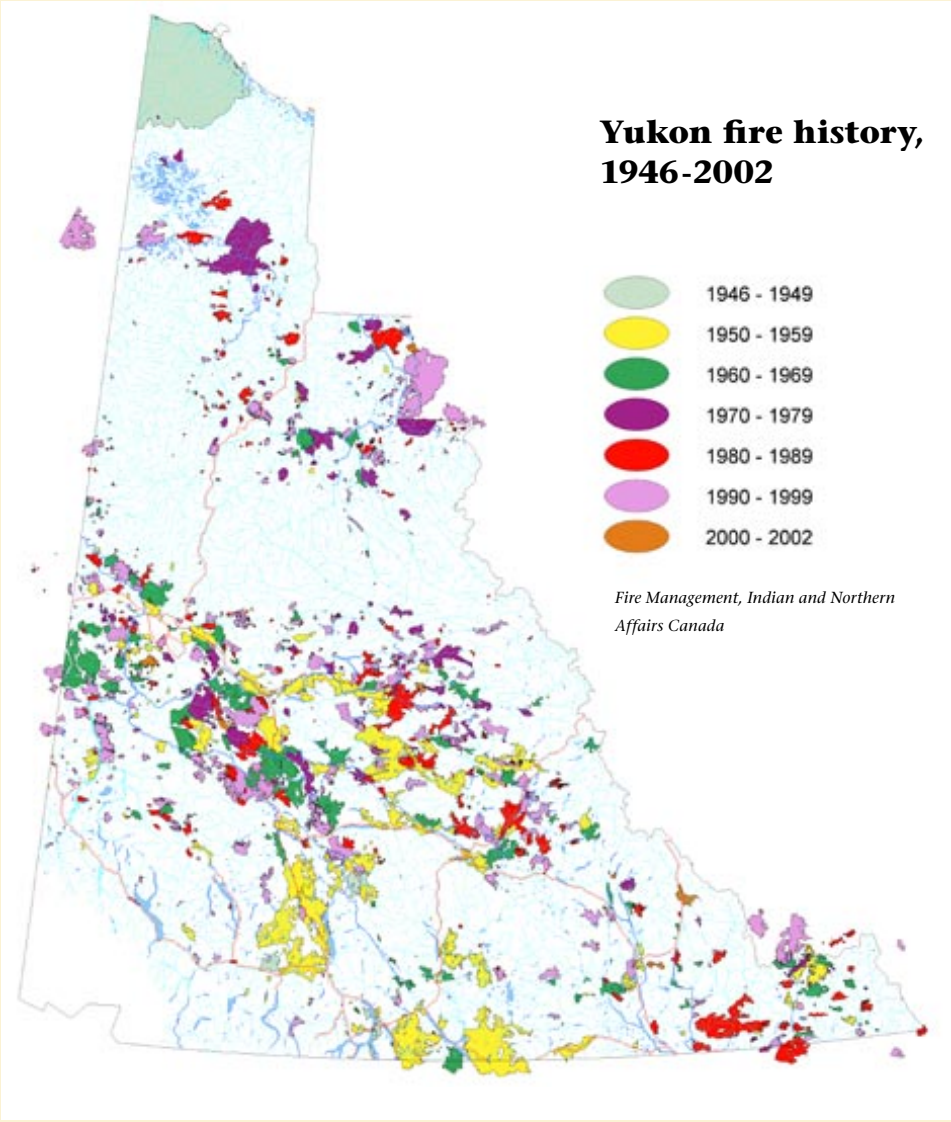
The boreal forest in the Yukon grows in a cold, dry climate on soils that offer limited nutrients. Trees grow extremely slowly, eventually limiting their own growth by tying up nutrients needed to support both trees and other plant life.

Insects, disease, fire

Old growth forests with many standing dead trees (snags) become favoured wildlife habitat and woodcutting areas. Marten and squirrels prefer old growth conifer forests and they are also important winter habitat for caribou.

Old growth forests are susceptible to insects, disease and fire. The insects in snags are food for woodpeckers. The holes woodpeckers make become homes for other birds and small mammals. When snags fall over, they decay, freeing nutrients to feed fungi and plants. They also soak up water like a sponge, releasing it gradually during dry periods.

Wildfires revitalize the boreal forest. Lightning strikes start burns that create open areas. The intense heat of a fire opens serotinous conifer cones, freeing their seeds. Fires also liberate nutrients and minerals that support new growth.



After a fire

Fast-growing pioneer species such as fireweed, grasses, alder and aspen grow up through the ashes. Their roots pull in nutrients released by the fire and help to stabilize the soil and limit erosion. When the new plants shed their leaves, nutrients return to the soil.

Some plants, such as vetch and alder, can take nitrogen from the atmosphere and convert it to forms used by other plants in the nitrogen-starved boreal forest.

Pioneer species give white spruce seedlings the shelter they need to mature into a new forest. As they mature, they gradually crowd out the aspen and other species that have given them their start.

This sequence of natural change in the boreal forest is called forest succession and may be brought about by a variety of natural disturbances. The earlier stages of succession, with more deciduous trees, are less prone to fire.

Different species of wildlife use areas opened up by fire. For example, moose and hares browse on new willow.

Wood burning, global warming

Given all the interest in the Kyoto accord on greenhouse gases and global warming, you might wonder how wood burning stacks up in that context.

Wood is considered a neutral fuel in the global warming debate. Living trees lock up carbon dioxide, a greenhouse gas, and act as carbon sinks until they die and decay or are harvested and burned.

Although burning wood produces carbon dioxide, no more is produced through burning than would be generated if trees were left to die and rot on the forest floor.

For this reason, it is not considered a net contributor to greenhouse gases.

COVER PHOTOS, top: Spruce log. Check marks show this piece of green wood is drying out. Peter Long; *middle:* Yukon government; *background: Hauling 13.5 cords of wood from Swede Creek to Dawson, on river ice.* MacBride Museum, 1990.1.3.43, George Pringle Coll.

INTRODUCTION

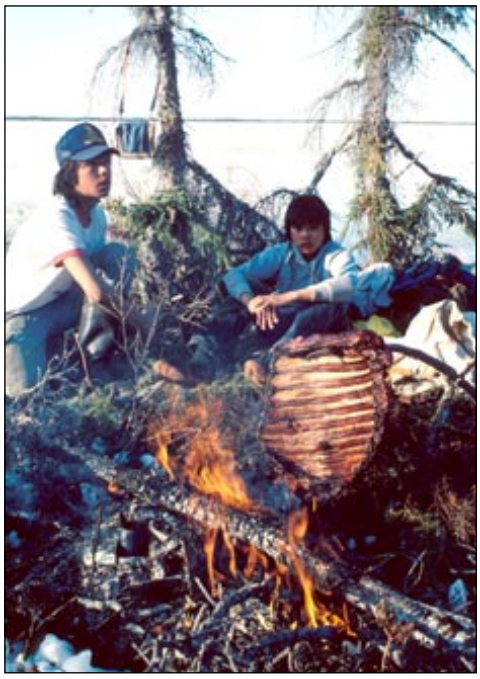
Wood fires have been part of the landscape and of human activity in the Yukon for thousands of years.

Human beings have needed the heat generated by fire for warmth, and to cook their food and support themselves in an extreme climate where snow covers the land and the temperature remains below zero for months of the year. Even today, almost a quarter of Yukon homes are heated with wood.

For anyone living in the north, a whiff of woodsmoke evokes memories of time around a campfire or at a cabin on a crisp autumn morning.

However, in built-up areas where many households are burning wood for heat, woodsmoke has other connotations. Breathing woodsmoke can result in respiratory problems. Everyone is at risk, however, children, the elderly and people with existing breathing problems are particularly vulnerable.

Over the last 10 years, much has been learned about the science of wood burning. Wood can be a safe and economical fuel. Careful attention paid to stove selection, installation (for example, chimney size, location and height), wood quality and burning practices will minimize effects on air quality and health, and reduce risk of fire.



Traditional cooking, Old Crow. Yukon government

A fast-burning fire in a high efficiency woodstove uses less wood and consumes most of the harmful smoke particles and chemicals found in unburned woodsmoke.

If you follow the wood-burning advice offered here, carbon dioxide and water vapour will be the main ingredients in your chimney gases.

You may still catch the scent of woodsmoke in the air, but only when a fire is started, before it is hot enough to consume unburned particles and chemicals.

In front of a shelter during a winter survival course given by Yukon College. Yukon government

Heating with wood

Today, close to a quarter of Yukoners (compared to about 5.4% nationwide) heat their homes with wood. This translates into annual fuelwood consumption of up to 50,000 cubic metres or 22,000 cords. While this sounds like a lot of wood, it is less than 5% of the Yukon's average annual firekill.

Many homeowners cut their own wood, but there is also a healthy commercial market in the Yukon. The supply of fuelwood has been valued at approximately $4 million a year in direct employment and import substitution.

Cordwood, delivered in 2.5-metre (8-foot) lengths or cut to stove length, serves most of the market. Entrepreneurs have also made efforts to sell wood-chip, wood-briquette and wood-pellet fuels.

Since wood is a high volume fuel, transportation is a significant factor in its cost, and firewood supplies are not always close to markets.

Your home insurance costs may increase if you heat with wood. Check with your insurer before you install a woodstove so that you can factor any additional costs into your decision making.

If you decide to heat with wood, you have a responsibility to your neighbours to burn cleanly. This is particularly true if you live in places such as Riverdale, in Whitehorse, where air quality problems can be acute due to air inversions during cold weather.

A simple shed keeps wood dry. Peter Long

ENERGY FROM THE FOREST: A YUKON TRADITION

The first people in the Yukon, facing a harsh climate and long winters, had fire as their companion.

About 10,000 to 14,000 years ago, when much of the rest of North America was covered with ice, its northwest corner offered a habitat — the beginning boreal forest — in which humans could survive. Stone artifacts dating to that time show that people were here.

Early shelters built around fire

Part of the Land, Part of the Water, Catharine McClellan's history of First Nations people in the Yukon, provides glimpses of the early human occupants and describes how they used fire.

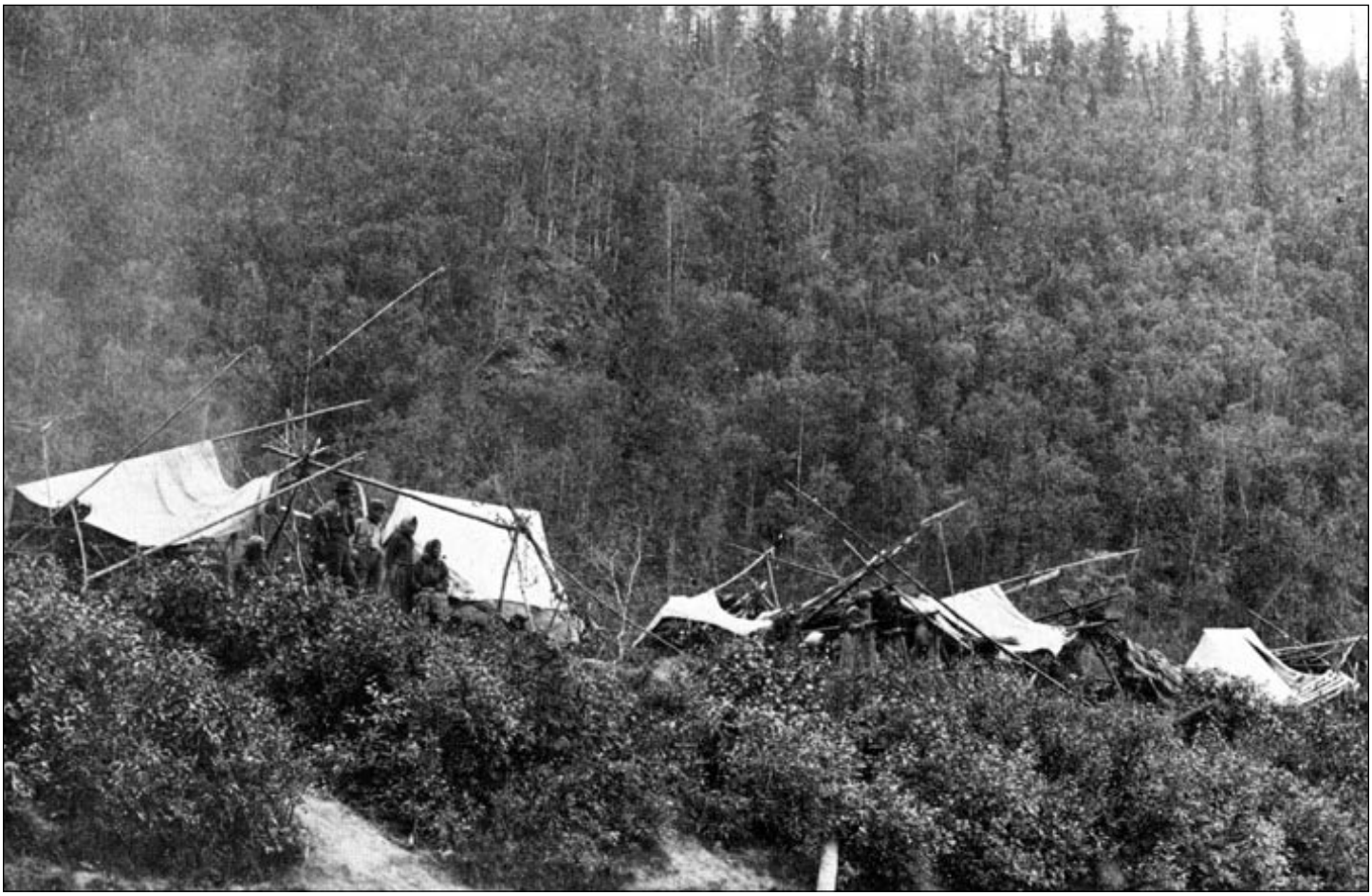
The Hän and Gwitch'in people built fireplaces at the centre of the moss shelters they often lived in for the coldest part of the winter. Roofs were made of brush covered with moss and earth, and a gap was left in the centre for the smoke to escape through.

Interior of a First Nation shelter, after contact with traders. Note dome-shaped frame of bent poles over which caribou skins have been hauled. *Used with the permission of the Publisher from "The Klondike Stampede" by Tappan Adney. © University of British Columbia Press 1994. All rights reserved by the Publisher.*

More temporary domed shelters were made of saplings and skins. Once again, the fireplace was placed in the centre for cooking and warmth, and a hole at the top, over the fire, let the smoke escape.

When families travelled together, a common shelter was made from two lean-tos facing each other, with a fire trench in between. The opening between the two structures allowed smoke to escape and the open ends gave access for the people and a draft for the fire. Brush and skins covered the framework.

Hunters travelling light built teepee-like structures of poles and brush, sometimes leaned around a tree and sometimes covered by skins. In these shelters, the fire was built near the door.



Tron'dëk Hwëch'in camp amongst the trees, just upriver of the mouth of the Klondike River, showing drying fish suspended off poles in the sun, 1894. *Yukon Archives, Veazie Wilson photographer, PAM 1897-66C*

Cooking over fires

Fires were used for cooking as well as for heat. Early people skewered meat or fish on willow sticks or branches and roasted it over open fires. To boil meat or fish, they heated rocks in the fire and then added them to containers made of carved birchwood, sewn birchbark or woven spruce roots.

The stomachs or paunches of moose or caribou were also used as cooking vessels in the same way. Sometimes, a raw hide was used to line a hole in the ground and water, food and hot rocks were added.

McClellan relates Selkirk-born Frank Smith's story about a contest with a white trader to see who could boil oatmeal fastest. Smith, cooking with hot stones dropped into a birchbark kettle, boiled his oatmeal before his opponent could even bring his pot to a boil on the top of a stove.

When trade goods such as brass and iron kettles and pots began to make their way into the Yukon interior in the 19th century, First Nations people began using these "modern" utensils.

Until the arrival of metal tools, twigs and branches were used to fuel fires, which were kept small and hot. First peoples only had stone axes to chop down trees.

At seasonal camps, trees were often "ringed" with a cut made into the bark around the trunk so that the tree would die and there would be dry branches for firewood the next time.

First Nations women with bowls of laundry at Moosehide Creek. Dawson City Museum, Isaac Family Coll.

Finding firewood

Areas where timber has been killed by wildfire or disease are the most popular places to harvest firewood.

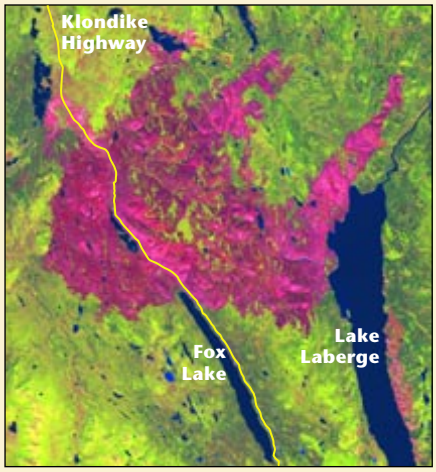
Burns

Every year, forest fires create new stands of "fire-killed" wood — dry, but dirty. Given a few years to weather, it becomes cleaner to handle.

Wood from the late 1950s Takhini burn fuelled Whitehorse homes right through the 1980s. More recently, fire-killed wood has been harvested from the 1991 Haeckel Hill burn.

Management authorities try to limit the impacts of firewood harvest. Indian and Northern Affairs Canada (INAC) directed activity in the Takhini burn by building access roads. The Yukon government put in place an access management plan for Haeckel Hill to protect its steep slopes from erosion.

Much of the current commercial fuelwood sold in Whitehorse is from the 1998 Fox Lake burn (pink on map below) along the Klondike Highway.



Fox Lake fire. Forest Resources

Old growth forest

Older spruce and pine forests with many dead standing trees can be an important source of fuelwood. However, the spread-out nature of the supply does not lend itself to commercial cutting unless there are high concentrations of dead trees, such as in burns and the beetle-kill area near Haines Junction.

For years, the old growth forest in the Carcross Valley has supplied thousands of cords of fuelwood to residents south of Whitehorse.

Development sites

Workers on highway, power line clearing and land development projects often notify INAC when clearing is planned. INAC then assesses the timber and advertises for expressions of interest in timber salvage.

Distance to markets often means there are no commercial takers. In that case, highway personnel ask clearing contractors to pile sawed logs so they can be salvaged by local residents.

FireSmart

FireSmart is the territorial government program to reduce the risk of wildfires around communities by encouraging forest thinning and clearing. At Mendenhall subdivision, workers on the FireSmart program separate and stack timber that is too small to be processed for lumber and encourage local residents to use it as fuelwood.

Country dwellers are encouraged to thin the forests on their properties to reduce fire risks.

More remote supplies

In Old Crow, a fly-in village north of the Arctic Circle, heating wood now costs $300 per cord. As William Josie, Renewable Resources Manager for the Vuntut Gwitch'in pointed out, "We've burned a lot of wood over the last 100 years." Ninety to 100 homes heat exclusively with wood, burning a mix of dry and green wood. Wood is rafted or barged to the village during the summer and hauled as far as 50 kilometres by skidoo in the winter. People are asked not to cut green wood in areas around the village.

A timber management plan is now in the works. In the meantime, a 1990 wildfire area three kilometres northwest of Old Crow may be accessed for fuelwood.

Old Crow. Yukon government

Newcomers

In the second half of the 19th century, traders and prospectors trickled north into the Yukon. Traders selected sites for early trading posts with an eye to the wood supply in the area. As more and more southerners arrived, woodcutting tools, such as steel-bladed saws and axes, made it possible to harvest any size of timber, whether for fuelwood or building. As a result, along their travel routes and around their settlements, the forests began to disappear. In her monograph, *A History of the Use of Wood in the Yukon to 1903*, Margaret Carter documented the impacts.

During the Klondike gold rush of 1898, some cheechakos, or newcomers, in a hurry to get to the gold fields, left campfires burning. This resulted in uncontrolled fires in such areas as Hootalinqua and parts of Teslin Lake, as well as smoke all along the Yukon River. Sometimes, areas were deliberately lit to clear ground or provide dry firewood for later use.

Initially, the newcomers lived in canvas tents and heated with tin stoves. Those who settled down built cabins made of logs with overlapping corners and roofs made of poles covered with earth and sod. For heating and cooking they used stone fireplaces or stoves made of steel and iron.

In the gold fields, flumes and sluicing go in every direction. Town of Eldorado, stores, a road-house and denuded hillsides in the background. Environment Canada, Parks, Headquarters, Anita Johns Coll., 116

As sternwheelers began to ply the waters of the Yukon, clearings in the forests grew around the stops where the boats picked up wood for refuelling.

Passengers on the first boats coming up the Yukon River from St. Michael, Alaska were shocked to learn that they were expected to cut wood — along with the deckhands — and help buck it once back on board.

Steam points thawing ground in preparation for dredging. Klondike National Historic Sites/Willi Wandl Coll., neg. 445, serial #232

Dawson

In Dawson, the concentration of people at the junction of the Klondike and Yukon rivers put major demands on the forest. To get to gold-bearing layers of gravel, miners burned fires day and night to melt shafts into the permafrost. This consumed 100,000 cords of wood per year, at going rates of $20 to $30 per cord.

Trees were also felled for construction. Hundreds of thousands of board feet of timber were harvested and milled to build flumes and sluice boxes (up to 100 per claim), as well as hotels, stores and housing in Dawson.

When miners discovered that steam could thaw the ground more quickly than open fires, they used wood to fire boilers that fed steam points driven into gold-bearing permafrost. This way, one third less wood was required.

Faster than anyone could imagine, the hills around Dawson were laid bare and battles raged over who had rights to cut timber.

At the start of the gold rush, “free miner certificate” holders were entitled to free use of timber for

In front of a steam point boiler shack.
Environment Canada, Parks, Headquarters, Anita Johns Coll., 76

mining purposes. In 1898, a Crown Timber Office opened in Dawson to grant permits and berths (cutting areas). Miners and woodcutters were soon in conflict as timber permits were granted in mining areas. F.X. Gosselin, the timber agent, learned quickly that it was best to issue cutting permits and berths outside of the mining areas.

Wood-cutting businesses sprang up and by 1899, rafts of wood were being floated into Dawson from up the Yukon River and there were log runs on the Klondike River. Permit holders paid 50¢ per cord of wood cut. Timber cutters paid $2 to $3 per 1,000 board feet. No stumpage was charged for wood cut for schools, churches, parsonages or the North West Mounted Police.

While looking at a 50- to 60-cord wood pile in her yard, Charlotte Bompas, the wife of an early Anglican

Huge piles of wood for steam thawing, 1912.
Yukon Archives, Schellinger Coll, 6003

Harvesting firewood

Regulations

The Forest Resources branch of Indian and Northern Affairs Canada is the successor to the Crown Timber Office. Offices in Whitehorse, Dawson City, Carmacks, Haines Junction, Teslin, Mayo, Ross River and Watson Lake issue both domestic and commercial firewood cutting permits for all federal land.

Firewood permits for home use are free of charge. Commercial cutters pay a $10 application fee and 25¢ per cubic metre (57¢ per cord).

Yukon Environment issues domestic firewood cutting permits for commissioner's lands in the vicinity of Whitehorse.

To limit the impacts on wildlife, the government issues permits to areas that already have trail access. A proliferation of wood-cutting trails can affect wildlife species such as caribou.

Starting April 1, 2003, all permits will be issued through one agency as management authority for federal lands is transferred to the Yukon government through devolution.

Buying wood

A cord of wood is a pile that is 1.2 metres high, 1.2 metres wide and 2.5 metres long (4 feet x 4 feet x 8 feet).

An average household might use six to eight cords per year if wood is the sole source of heating fuel. In Whitehorse, wood prices range from $100 per fire-killed cord in 2.5-metre lengths to $145 per cord for clean, split, stove-length wood.

Green wood

Green wood contains 35% to 50% water by weight and should not be burned until seasoned to less than 20% moisture. Burning wet wood wastes much of its heating value and leads to incomplete combustion, excessive smoke, and creosote build-up in chimneys.

Woods, such as aspen and poplar, have very high moisture content and should be split and seasoned for a full

Wood moisture testers are available at hardware stores. Cathie Archbould

year before being used as fuelwood. If your firewood feels heavy for its size, it should be seasoned longer. Splits, or checks, start to appear as the wood dries.

Wood splitting tools

While a few people still cut wood with swede saws, most wood burning households use chainsaws.

Chainsaws with 50- to 70-cc motors and 40- to 45-centimetre bars are adequate for cutting, limbing and bucking.

Axes cut cleanly into the butt of a log, but may lack the heft and width to split thicker wood.

Mauls have weight and wedging action, but may be too heavy to handle for smaller people.

New maul designs that are a cross between axe and maul profiles feature a thinner blade edge and a lighter head with ramped sections that spread and split the wood. They are easier to handle and still capable of splitting the big stuff.

Wood should be stored outside of the house, already split, and in rows that are spaced a few inches apart to allow for air circulation and seasoning. Cover the tops of the rows to keep the wood dry. Peter Long

Little Sam's last raft of wood on its way for sale in Dawson. Catharine McClellan recounted that rafts could have up to seven sections. Each section was made of 16-foot lengths of dry wood, up to 32 feet wide, and drew about two and a half feet. Johnny Tom Tom talked about a raft containing 156 cords of wood for which he received $14 per cord, on the water. Yukon Archives, Drury Coll., 81/333, #62. *(inset) Wood raft on the Yukon River.* Yukon Archives, J.P. Kirk Coll.

bishop, wrote, "I fear that our large pile will hardly carry us to spring."

Charles Dubé installed a steam-powered hydraulic pump on his ground on Bonanza Creek. He was pleased that it only used about 300 cords of wood a year!

After the gold rush, hand mining gave way to steam-powered shovels and dredges. These were then displaced by electrical machinery once hydropower became available.

Until the Twelve Mile power plant was constructed in 1907, a steam-powered electric generator in Dawson burned 24 cords of wood per day to supply electrical power to a town that was taking on the trappings of a city.

Power house at Bear Creek. Klondike National Historic Sites binder 42/167

In the early years of the 20th century, after the advent of mechanized mining, would-be miners-turned-woodcutters found work on the dredges, moved on to gold fields in Alaska or wandered south again. This opened economic opportunities for First Nations people to cut and raft wood for the timber and fuelwood contractors who supplied Dawson and the riverboats.

Whitehorse

Whitehorse began as a small town at the terminus for the White Pass and Yukon Railway trains and the British Yukon Navigation Company steamboats working the Yukon River.

According to Flo Whyard, in *Ninety Years North,* by 1901, wood was being used to fuel the boilers at The Yukon Electrical Company Ltd. (YECL), powering two electrical generators which provided electrical lighting for several hours a day. YECL paid $6 per cord of fuelwood to Louis Belamy, who shipped his wood into town from Cowley Station on the railroad. (The steam-driven generators at YECL were replaced by diesel units in 1935.)

Other well known Whitehorse residents were in the wood business. James D. Richards, or "Buzz Saw Jimmy," was immortalized and illustrated in Jim Robb's *Colourful Five Percent* as a "mechanical genius." Buzz Saw Jimmy built a buzz saw out of an old tractor and a Model-T Ford; with it he could cut eight to 10 cords of stove-length wood per hour. According to Robb, Buzz Saw Jimmy lost his leg to the saw "sometime between 1915 and 1917."

Laurent Cyr, now 83 years old, worked for Jimmy, though he counts himself lucky it wasn't for long. He's not sure what he might have lost to the saw.

Cyr's father, Tony Cyr, initially supplied domestic wood to Whitehorse from his wood lot on the flats at the top of Puckett's Gulch, at the end of Black Street. The First Alaska Air Expedition landed in his wood lot clearing when it pioneered air traffic to the Yukon and Alaska in 1920. From that clearing, the Whitehorse airport grew.

The Ryder family started supplying wood to Whitehorse in 1907, according to 80-year-old Lloyd Ryder.

During the 1920s and 1930s, people working for the Ryders cut green wood in what is now the Granger area. Then, a few years after the 1927 fire around Maclean Lake, they went after that fire-killed wood.

Lloyd's father, George, used horses to haul wood to a storage yard at the top of Puckett's Gulch until 1937 when the family business acquired a Caterpillar tractor. From Puckett's Gulch, they hauled wood downtown to a yard where the Stratford Motel sits today. There they bucked it up into stove lengths, using a circular saw with a one-cylinder Fairbanks-Morse engine.

Lloyd Ryder recalls that people bought eight to 14 cords a winter to heat houses that had "hardly any insulation in them." Later on, Lloyd's brother bought an International tractor with a saw attachment and they could buck wood "right at the customer's house."

Sternwheelers

In 1901, about 30 steamboats navigated the Yukon River between Dawson and Whitehorse, and worked the big upper lakes out of Carcross. The sternwheelers burned an average of a cord of wood an hour, needing far more than that if they were pushing upstream against high water or shoving a barge.

Steamships continued to work the rivers for the next half century, burning hundreds of thousands of cords of wood. That made the supply of wood for the steamboats an important Yukon industry. Individuals along the water route were contracted by the steamship company to supply the fuelwood.

Captains were required to keep a list of where they had obtained their wood. If the cutter had not paid the stumpage, the captains themselves were held responsible.

The sternwheelers' insatiable demand for fuel meant that wood camps dotted the Yukon River every 35 to 65 kilometres between Whitehorse and Dawson City. Later, this became true for the Stewart River route to Mayo, shipping point for Keno Hill silver and lead, as well as the Pelly and Teslin rivers.

Wood contractors built cabins and set up camps along the river. They

On a scow in the Yukon River, with what appears to be a small paddle wheel and boiler.
Edmund C. Senkler Coll., #38/183, Parks Canada, Klondike National Historic Sites

Looking at woodstoves

The efficiency of wood burning depends on three factors: stove efficiency, wood quality and burning technique.

Before you decide on a woodstove

Most wood burning space heaters radiate heat; they do not distribute it as a furnace does, through ducts. This means you should first look at how space is organized in your house.

Space heaters work best in houses with open floor plans. Where there are few walls, heat can move around. It is hard to evenly distribute heat when the floor plan is broken up into rooms.

Size your stove to the space you want to heat. Too large a stove may result in overheating or poor burning, creosote build-up and hazardous smoke.

Choosing a woodstove

Choose an efficient stove that gets all the energy out of the wood and leaves the chimney and the air clean. Stoves that meet the Environmental Protection Agency (EPA) efficiency standard can cut wood consumption by 30% and reduce emissions by up to 90%. (Although there is a Canadian standard, CSA B415, equivalent to the EPA standard, currently no stoves are being manufactured to that standard.)

Stoves that meet or match EPA standards fall into three design categories.

Advanced combustion stoves

Advanced combustion stoves use special firebox designs to inject heated air and encourage complete combustion. Baffles inside the stove create turbulence to direct wood gases back into the fire for a more complete burn.

The fire box insulation (such as firebricks) stores heat, stabilizes firebox temperatures and promotes more complete combustion.

The air supply, both primary and secondary, is pre-heated to keep combustion temperatures high, around 500°C.

Catalytic stoves

Catalytic stoves exhaust woodsmoke through a catalytic combustor that ignites unburned smoke gases and particles. The platinum or palladium in the combustor lets smoke gases burn at lower temperatures (250°C).

These stoves burn cleaner and produce more heat, particularly under low fire conditions. The catalytic combustion unit must be replaced periodically and is easily ruined if contaminated materials, such as advertising leaflets, are burned.

Pellet stoves

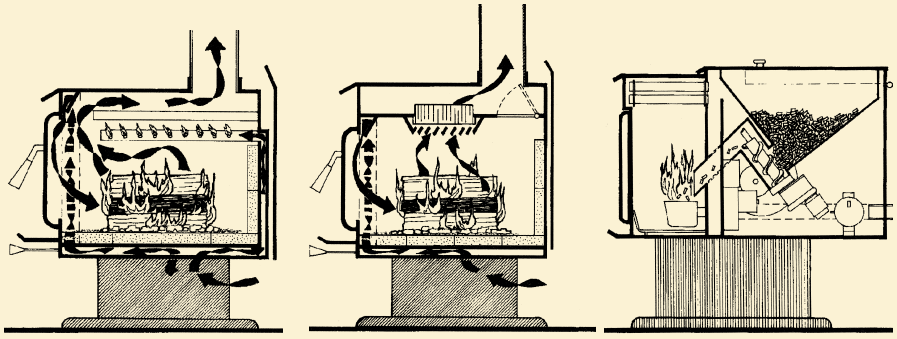
Pellet stoves burn wood pellets one to two centimetres long and the diameter of a pencil. Hoppers built into the appliance feed the fire. A full hopper can feed a fire for as long as 24 hours at a stretch.

The fuel/air mixture can be adjusted so that the pellet stove produces a wide range of heat outputs.

Electricity is needed for pellet stoves because they use fans for combustion air and a motor-driven auger to feed pellets to the fire. A few pellet stoves come equipped with a battery to power fan and auger motors during electrical power failures.

Double-wall piping allows pellet stoves to exhaust through a wall instead of a chimney.

Currently, the pellets needed for these stoves are not being produced locally, but there are suppliers in the Yukon.



Advanced combustion stove *Catalytic stove* *Pellet stove* NRCan

S.S. Casca ready to sail, Dawson, October 11, 1908. MacBride Museum, 1989.3.1.411, Transportation Coll.

depended on First Nations men to cut the wood and used horses to haul cordwood to the landings.

Senator Ione Christensen, who spent her early years at Fort Selkirk on the Yukon River where her father, G.I. Cameron, ran the RCMP detachment, remembers it as a "good arrangement." The steamboats were "the lifeline for supplies and mail."

Christensen says that in the 1940s and 1950s, the camps around Fort Selkirk did not require cutters to sign on for the whole winter. Instead, First Nations people would come out of the bush, set up their tents, cut for a week or 10 days and then return to their traplines. They were paid by the cord, giving them a cash income to supplement their traditional lifestyle.

Alec Coward, who contract-cut near Fort Selkirk, used an old Model-T truck to haul his cordwood to the river. One-armed Findlay Beaton cut all his own wood and used two horses to haul it to the landing.

Wood was stacked in long parallel rows at steamboat landings. Laurent Cyr spent a number of seasons working on the sternwheelers in the early 1930s — washing dishes and later waiting tables. He says the contracts called for the "four-foot" fuelwood to be stacked in "six-foot" tall rows and Christensen remembers riverbank piles 60 metres long and two, three or four rows deep.

Every five or six hours, when the boats stopped for refuelling, the purser measured off what was to be loaded and marked the pile with chalk. Deckhands from the boat stacked the fuelwood on two-wheeled trolleys, "way jacks," and skidded them down the gangplank onto the boat.

"They'd sit down on their boots and brake that way," Christensen recalls. They had to swing off the gangplank to get into the boat at the bottom. "Sometimes they'd miss the turn and go right over the edge." She says her father tried for years to capture movie footage of that.

On the boats, stokers, stripped to the waist, constantly fed fuelwood to the boilers. Cyr says that even though they were getting $85 per month in the early 1930s and he was paid just $60 a month to wait tables, he tried stoking one trip and "wouldn't do it again."

One winter, Cyr also cut wood for the steamboats, about a hundred miles upstream from Dawson City. By spring, he had over 200 cords piled at the river, but it all "went out with the ice." He wasn't the only contractor to have that experience.

In the 1920s and 1930s, gold production from Dawson fell substantially and only the silver-lead-zinc mines at Keno Hill prevented a total collapse of the Yukon economy. The ore haul

(left) Loading cordwood onto hand trucks at Keno, 1933. Gordon A. McIntyre #126, Parks Canada, Klondike National Historic Sites Binder 42(b)/126
(right) Gangplank for loading wood onto sternwheeler. In this case, the wood is being loaded for a move from one wood yard to another because the first yard had become unsuitable due to very low water levels. Cyril Doheny Coll., #6, Parks Canada, WH Transportation Binder #2/61

Four-horse team hauling full load of wood on river ice. Moosehide Mountain slide site in background. MacBride Museum, 1990.1.3.44, George Pringle Coll.

from the mines went by sternwheeler and barge from Mayo, on the Stewart River, to the railhead at Whitehorse, on the Yukon River. It became the mainstay of river commerce as river traffic to and from Dawson dwindled. By 1933, even with that traffic, there were only seven steamboats left on the water.

Fuelwood harvesting for the steamboats laid bare some stretches of the Yukon River. Cyr remembers that, by the time the steamers stopped running the river, one wood camp was 19 kilometres back from the landing.

Eventually, the British Yukon Navigation Company installed oil tanks on some boats and converted the boilers so they could handle either wood or oil.

Finally, in 1955, the steamboats stopped running because the last part of a new, year-round road — now the Klondike Highway — was pushed through from Stewart Crossing to Dawson City.

Christensen recalls that the construction of the roads to Mayo and Dawson and the end of the steamboats marked a major change in the subsistence economy. First Nations people moved away from the Yukon River and settled where the road crossed its tributaries. The cash economy of cutting wood for the sternwheelers disappeared. Life along the river slowed, Fort Selkirk became a ghost town, and new growth covered the wood camps and landings that once lined the river.

Considering wood heating alternatives

Central heating systems

In the late 1980s and early 1990s, wood-fired or combination wood/oil-fired furnaces and boilers were a popular heating source. However, with more energy efficient housing and higher wood costs, the market for this technology has softened.

Central heating systems make most sense if a house is big and requires a lot of heat, it is broken into many small rooms, or it lacks a good location for a high efficiency woodstove or fireplace.

Also, the homeowner should have good access to low-cost fuelwood, want to limit wood to the basement area of the house, and not put a high value on viewing the fire.

In the above circumstances, consumers may wish to consider either a wood-fired system or add-on wood-fired unit that can be combined with an existing oil, propane or electric central heating system. Care should be taken to install safety-tested, certified equipment.

Fireplaces

Conventional fireplaces are inefficient heaters, often sucking warmth from living spaces whether they are being used or not. However, glass door assemblies can reduce heat losses, and approved inserts can convert fireplaces to useful heaters.

A *hearth-mount stove* may be a workable alternative to an insert. This involves the use of a stove certified for installation in front of, or inside of, an existing fireplace.

Both hearth-mount stoves and fireplace inserts now require stainless steel chimney liners from the appliance to the top of the chimney flue.

Some fireplaces are certified as low emission appliances and have combustion features similar to those used in space heaters, such as secondary combustion and catalytic combustors.

High efficiency fireplaces use heat exchangers to return heated air to the room in which they are located. Some also allow connections to ducting and fan systems to distribute heat to other parts of the house.

High efficiency fireplaces are best considered during initial housing design and should be installed by professionals.

Masonry heaters

Heat storage masonry heaters are enjoying a renaissance today. They were developed in the 17th century, after European forests were stripped of fuel. Since people had only faggots or bundles of twigs to burn, they had to get the most use out of every fire. The result was stoves that use a couple of tonnes of rock or masonry to store the heat produced by each firing.

Modern masonry heater designs can be quite efficient, turning most energy stored in the wood into heat that is absorbed by the brick and then radiated back into the home for the rest of the day.

Masonry heaters have high initial costs and specialized foundation requirements, so they are best considered when you are designing a new house.

This Swedish masonry heater features a refractory cement core, secondary burning chamber, bake oven and 4.5-metre flame path. It adds heat to the home by acting like a huge radiator in the middle of an open concept house. Burns last for about two hours, consuming 23 kilograms of wood split to seven centimetres or less in diameter. The stove continues to provide heat to this 200-square-metre house for 12 or more hours, depending on the season, and uses only three to four cords of wood a year. Chris Scherbarth

The war years

In 1941, when the entire Yukon had a population of about 5,000 people, the last mine, the Treadwell-Yukon mine and mill at Keno Hill, shut down. The Yukon economy was left without an engine until the U.S. Army put the economy on the road with its plans to build the Alaska Highway.

On February 12, 1942, the U.S. government approved construction of the Alaska Highway as a defence measure. It would follow part of the chain of Lend-Lease airports which stretched across northeastern British Columbia, through the Yukon, Alaska and across Russia, and serve as a supply line in the event of a Japanese invasion of the 50th state.

Suddenly, the Yukon population swelled from 5,000 to over 20,000. Most newcomers were members of the U.S. military or workers for the civilian contractors building the Alaska Highway.

John Paxton at Champagne Camp in front of his "home at 75 below." Paxton, a member of the U.S. Army engineers, took many photographs during his time in the north. On a return trip to celebrate the 50th anniversary of the building of the Alaska Highway, Paxton donated these photos to Yukoners. MacBride Museum, John Paxton Coll.

Whitehorse

Woodcutters benefited from the boom. Lloyd Ryder cut a lot of wood on the Riverdale side of the Yukon River, out towards Long Lake. He remembers buying wood from the cutters at $8 per cord and selling it bucked up and delivered for $15 or $16 per cord.

Laurent Cyr, who had taken over his father's woodcutting and hauling business, made good money in those years too. He delivered 1,000 to 1,200 cords a year. He paid $4 a cord to fallers, mainly First Nations men, and hauled it into town by truck. A 36-inch circular saw mounted on skids cut it into stove lengths. Cut and split, it sold for $16 a cord.

According to Cyr, the army men were not used to wood fires and "the army burned many buildings downtown." In time, the U.S. Army got the hang of wood heat and even built a wood-fired district heating system that serviced a number of its buildings.

Cyr says that by the end of the war, the easy wood around Whitehorse was gone and some people were hauling wood from as far away as the Atlin Road. He quit the wood business in 1946.

(left) Early chainsaw used during the building of the Alaska Highway and (right) cutting timber with a crosscut saw. MacBride Museum, John Paxton Coll.

According to Paxton, "When the big freeze came, standing wood became too brittle to saw so trees were snapped off with an R-4 dozer. The sawmill was closed after the logs broke off the saw teeth." MacBride Museum, John Paxton Coll.

As the highway boom ended, the demand for wood fell. There was an oil refinery in Whitehorse by then, fed by the Canol Number 1 pipeline from Norman Wells. And Canol Number 2 linked Whitehorse to tidewater at Skagway. All the talk was about the possibilities associated with the new refinery.

Although the Whitehorse refinery was decommissioned after less than a year's operation, and the Canol Number 1 pipeline was abandoned, oil still seemed the energy source of the future.

During the late 1940s and early 1950s, many people switched to oil for heating. By 1948, Lloyd Ryder had started delivering stove oil. He remembers that people resisted the change. "They thought wood was safe, and worried about oil."

Wood remained popular because it was cheap — free if you could cut it yourself.

Caterpillar pulling sleighs loaded with wood. Environment Canada, Parks, Historical Services, Prairie and Northern Regional Office, Winnipeg, George Townsend Coll.

Installing a woodstove

If your house design lends itself to space heating, your stove should be placed in the part of the house you want to be the warmest. This usually means a living area on the main floor.

The basement is not a good location unless your family spends much time in a basement family or rec room. Unfinished basements with poorly insulated walls and floors soak up heat from the woodstove and leak it to the outside.

Keep in mind that your stove will require a chimney (unless it is a pellet stove), and that chimneys work best when they run inside the house, straight up from the stove.

You must obtain a building permit before installing your woodstove.

Proper installation of a space-heating appliance takes care and attention, and will contribute to years of safe and efficient operation. Improper installation can be both unhealthy and unsafe.

Wood Energy Technology Training

Technicians certified under the national Wood Energy Technology Training (WETT) program receive specialized training in the installation and maintenance of wood-fired appliances and chimneys. Their training also provides an overview of wood heating technology and the regulations that govern the safe and energy-efficient installation of wood burning appliances.

For more advice on selecting, locating and installing a woodstove, the Energy Solutions Centre can put you in touch with WETT technicians or supply you with *A Guide to Residential Wood Heating* produced by Natural Resources Canada and CMHC.

Myths

"Bigger stoves are better stoves."

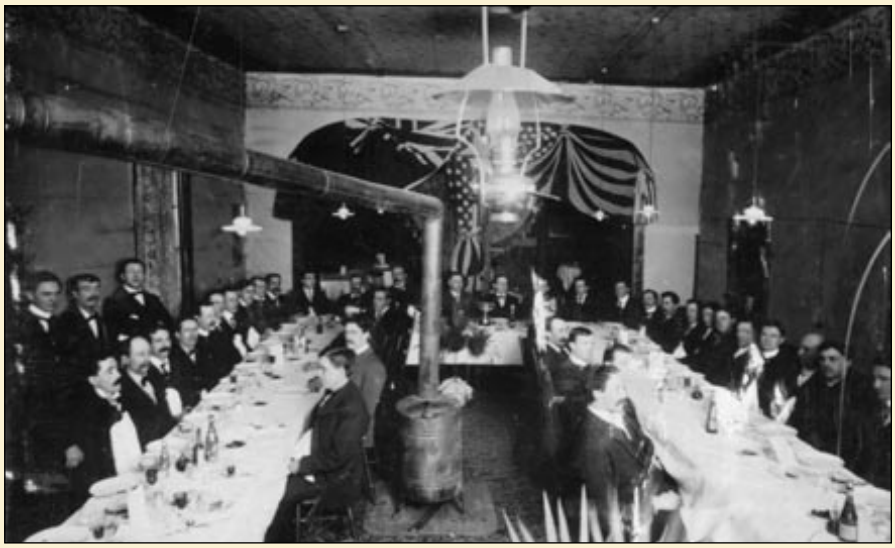
Not true. Any stove that is oversized for the space it is heating either sweats out the occupants or burns incompletely, producing creosote and emissions.

"Remote wood boilers are a good solution to home heating needs."

Not true. Unless used to heat a very large space, remote wood boilers burn at too low a temperature to consume the pollutants in woodsmoke. They waste wood and produce emissions. Only 50% efficient (claims for higher efficiency should be carefully checked), they produce 50 grams of smoke per hour, about a kilogram of particulate matter over 24 hours.

"Bigger chimneys are better."

Not true. Installing the smallest diameter chimney recommended is usually best. Longer chimneys (above the roof line) are also better. They improve the draft and help prevent smoke from being drawn down to ground level.



A.C. Co.'s fire company banquet, Macdonald Hotel, Dawson, interior of banquet room with woodstove, January 19, 1901. Macbride Museum, 1989.2.1.283, Unidentified Personalities Coll.

Wood revival

Throughout the 1950s and 1960s, oil and wood continued to be the most common heating fuels in the Yukon. Then, in late 1973, an Arab oil embargo sent oil prices soaring.

In the Yukon, with its ready supply of firewood, woodstoves became a popular response to higher oil prices.

Around this time, Bert Wolfe started working for Fred's Plumbing and Heating, a business he later bought. He says that until 1973, most woodstoves were loosely built, sucked lots of air and gave "fairly clean burns." Stoves like this made sense when buildings were poorly insulated and drafty, firewood was cheap or easy to cut, and no one worried about air quality.

But after years of the convenience of oil furnaces, people buying woodstoves now wanted a long-burning fire. As a result, Wolfe says, manufacturers began to build airtight stoves with welded seams and gasketed doors "that provided a long burn by limiting combustion air."

Winter haze and smoke over Dawson City. Yukon government

In these stoves, fires smouldered, instead of burning hot and fast, and chimneys got clogged with creosote deposits that led to chimney fires. A rash of such fires in the 1970s and early 1980s led to new government standards for woodstove chimneys designed to withstand multiple chimney fires.

In 1980, the Canadian government responded to continuing concerns about energy costs and oil self-sufficiency by introducing the Canadian Oil Substitution Program (COSP). Under it, homeowners became eligible for grants to buy woodstoves to reduce oil consumption.

According to Wolfe, "everyone got into the wood burning business and anybody who had an idea and a welder built a box and put a flue collar and spin dampers on it."

The increasing numbers of people living in country residential subdivisions were happy to buy big airtight

Paul Sheridan's dual fuel, Jetstream wood boiler and oil backup, is still heating his 170-square-metre home more than 20 years later, using only two and a half cords of wood per year. A very advanced design for its time, the Jetstream uses fan driven, pre-heated air to completely consume both wood and smoke, sending only carbon dioxide and water vapour up the chimney. The system has a number of temperature sensors and uses a large, insulated water tank as heat storage. The Jetstream also pre-heats the hot water for the house. Peter Long

Buying wood

Long-time Whitehorse residents may remember the huge wood pile outside of the Jacobs Welding shop at the bottom of Two Mile Hill. "You can't go wrong with spruce or jack pine," says Ed Jacobs, who used to burn 85 to 90 cords a winter to heat the shop. He bought wood all the time.

"The secret of buying wood was to make sure they delivered it during the day so you could measure it. Some guys would drop the wood off at night and come around during the day to get paid. Well, you couldn't tell what they had brought!

"Some people were generous with their loads, so I was generous to them."

An RSF woodstove, popular in the 1980s.
Energy Solutions Centre

stoves that could keep a large fuel load burning for hours. People working in town all day wanted to come home to a warm house. But the oxygen-starved, slow burning fires wasted much of the energy in the wood and billowed black smoke into the air.

Given these burning practices, people in the Yukon, as in the rest of Canada and the United States, began raising concerns about the health implications of heating with wood.

As research on the impacts of wood heating began outside the Yukon, people here counted on their woodstoves to keep them warm.

This woodstove, built by Phil Davignon, heated Johnson's Crossing Lodge even at -30°C, using up to 40 cords of wood a year.
Yukon government

Controlling woodstove emissions

Modern, high efficiency woodstoves that burn wood cleanly did not come about by accident. Wood burning in highly populated areas during the 1970s and 1980s led to increased public concern about air quality and health implications.

Woodsmoke contains harmful pollutants that can trigger coughs, throat irritation, headaches, respiratory problems and cancer, increasing pressure on the health care system and leading to days lost from school and work.

Those most susceptible to the pollutants in woodsmoke are the elderly, and people with heart or lung disease. Children are also at risk because they breathe faster than adults and spend more time outside.

Developing standards

During the 1980s and 1990s, governments developed performance standards for woodstoves and regulations that required reduced emissions.

The state of Oregon was the first to address the problem. In 1984, the Department of Environmental Quality (DEQ) began testing stoves to wood burning standards designed to reduce emissions. In response, manufacturers developed stoves that burned hotter and consumed most contaminants in the smoke before sending it up the chimney.

By 1986, Oregon required all new stoves in that state to be DEQ-certified. In 1988, the U.S. Environmental Protection Agency (EPA) developed national woodstove performance standards, revising them in 1995. EPA stoves now produce 94% less particulate matter, 84% less volatile organic compounds and 85% fewer polycyclic aromatic hydrocarbons than traditional woodstoves.

Today's EPA-certified stoves get 10 to 13 hours of heat production while still burning cleanly and they outperform old stoves by using a lot less wood.

In 1992, the Canadian Standards Association developed the CSA B415 standard for woodstoves. These were upgraded in 2000, also setting emission standards for furnaces, boilers, low burn rate fireplace inserts and automatically fuelled stoves.

Contaminants in woodsmoke

acrolein: can cause eye and respiratory tract irritation.

carbon monoxide (CO): can displace oxygen when breathed in, leading to oxygen shortages that stress the heart. At higher levels, it causes fatigue, headaches, dizziness, nausea, confusion and disorientation. At very high levels, it can lead to unconsciousness and death.

dioxins and **furans:** some of these chemical compounds are carcinogenic.

formaldehyde: can trigger asthma and cause coughing, headaches and eye irritation.

hydrocarbons (HC): can damage the lungs.

oxides of nitrogen (NO): can lower resistance to lung infections, cause shortness of breath and irritate the upper airways.

particulate matter <10 microns in diameter (PM10): a toxic substance under the Canadian Environmental Protection Act. Particles this size can be inhaled deep into the lungs, leading to serious respiratory problems.

polycyclic aromatic hydrocarbons (PAHs): may pose a cancer risk if there is prolonged exposure.

volatile organic compounds (VOCs): can cause respiratory irritation and illness. Some VOCs in woodsmoke, such as benzene, are known carcinogens.

Local smoke standards

In 1988, the City of Whitehorse adopted a two-part wood burning bylaw. The first part allowed the city to impose a "no-burn" order for the Riverdale neighbourhood of Whitehorse, depending on air quality. Homeowners could be charged for violating a no-burn order.

The second part of the bylaw allowed for warnings or charges if a specific homeowner was producing too much smoke from their chimney.

Although warnings were issued under this section, no charges were ever laid. In 1997, the city rescinded the wood burning bylaw.

The City of Whitehorse now regulates the kinds of wood burning appliances that can be installed within city limits to encourage high efficiency, low pollution stoves. Before installing a woodstove, check with Building Inspection, City of Whitehorse, at 867-668-8340, to obtain a building permit.

Outside of Whitehorse, contact the Yukon government, Building Safety, Community Services, at 867-667-5741.

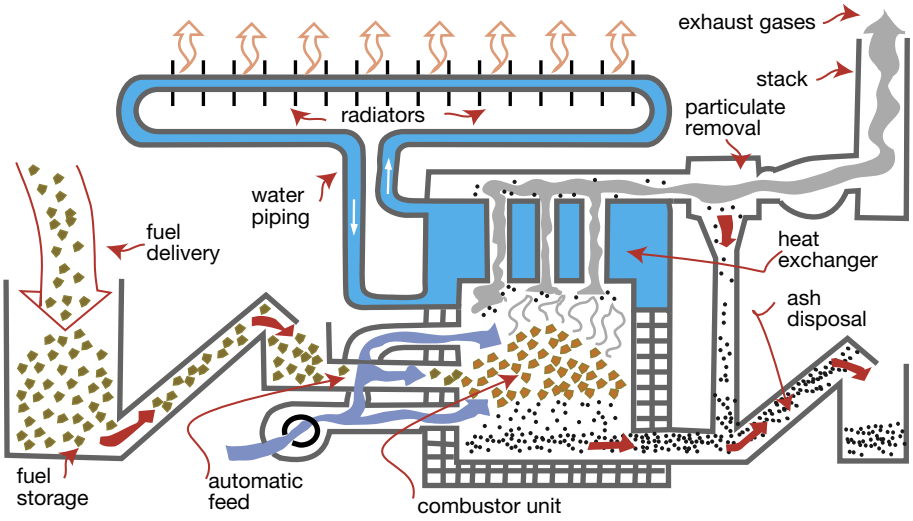
Commercial wood heating

Despite growing awareness of potential health problems, the same factors that encouraged homeowners to heat with wood led to the development of commercial-scale wood or biomass heating systems in the 1980s. Although wood is the logical Yukon biomass fuel, other plant and animal materials, such as straw, grass and dried manure are used as biofuels elsewhere in the world.

The Yukon government was interested in biomass heating systems because wood fuel could displace expensive imported heating oil with a locally available energy source.

During the 1980s and 1990s, this led to the installation of a fluidized bed gasifier at Yukon College and wood-chip/pellet boilers at Eliza Van Bibber School in Pelly Crossing and Elijah Smith School in Whitehorse.

A fluidized bed gasifier uses conventional fuel, such as oil or propane, to heat a bed of sand to a temperature high enough to vaporize biofuels. When wood chips or other biofuels are introduced to the heated bed of sand, they produce gases that are then used to fuel a boiler.

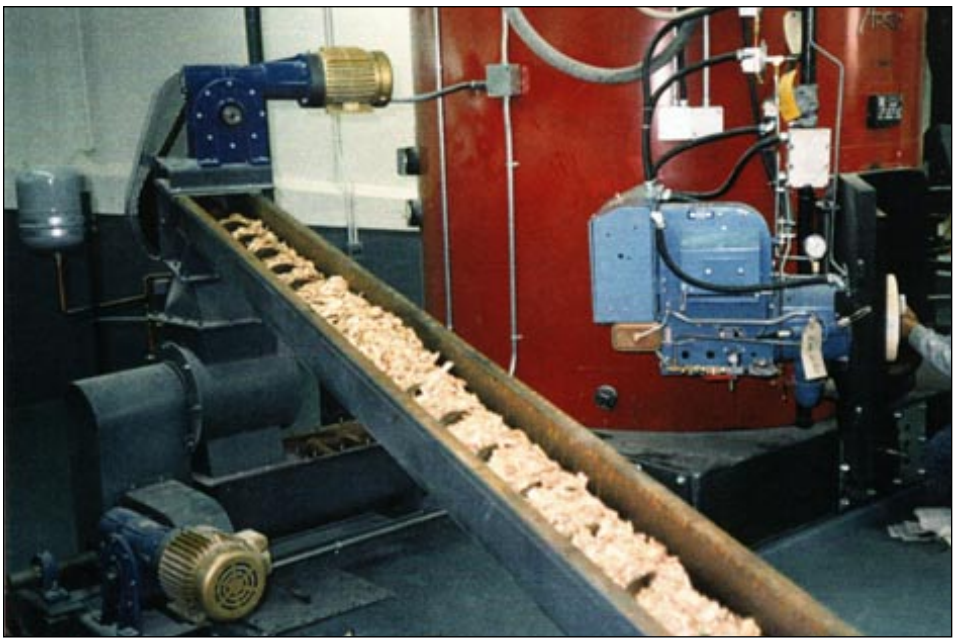


Wood-chip or pellet fuels, derived from saw mill waste, can be fed mechanically, eliminating the need for hand stoking. NRCan

Although the fluidized bed gasifier at Yukon College was operated experimentally, it has never been used on a day-to-day basis. Some people still believe that with proper controls the system could be made to work.

After almost 20 years of operation, the wood-chip boiler system in Pelly Crossing is beyond its economical life and is being removed as part of a major renovation to the school.

The wood-chip boiler system at Elijah Smith School in Whitehorse remains unused due to the lack of a reliable and economic fuel source and the problems moving the chips from the truck to the feed silo. It has operated successfully on both wood-chip and Yukon-produced wood-pellet fuels.



Wood boiler with dual-fuel capacity, at Elijah Smith School. It can use shavings and sawdust, wood chips, wood pellets, off-cuts and cordwood. Additionally, propane can fire the boiler in the absence of wood fuels. (Cover removed to show spiral auger and wood chips.) APSCO Engineering Ltd.

District heating

In the late 1980s, the Yukon government contracted with Klondike Central Heating to supply heat to the Andrew Philipsen Law Centre on Second Avenue in Whitehorse.

Manfred Peschke and his partners in the company then installed a wood-chip-fired district heating system behind their Yukon Business Services Building at 307 Jarvis Street. Wood-chip deliveries were made into a bin covered by a heavy steel plate, still visible in the alley behind Yukon Cinema.

Peschke says that the boiler system operated well, producing heat at specified temperatures. While the project enjoyed strong support from the Energy Branch of the Yukon government and there was political will to see it work, boiler inspectors and heating system people at the Law Centre were less comfortable with the technology. According to Peschke, his boiler was not being used as a primary heat source for the Law Centre and without this base volume, the district heating plant proved uneconomic and was put in mothballs.

With some financial support from the Yukon government, several Yukon First Nations, including the Little Salmon Carmacks First Nation, the Kluane First Nation and the Champagne and Aishihik First Nations, have installed commercial wood boilers to meet their institutional needs.

Problems, but potential

Today, however, most of the commercial wood-chip boiler systems in the Yukon are operating on back-up fuels. Although the technology has been proven to work, the biggest obstacle to continued use appears to be a reliable fuel supply.

To be economically viable, commercial heating plants in other parts of Canada have generally required forest product waste wood at zero cost. In the Yukon, no mills are generating high volumes of wood waste, and there have been concerns expressed that supplying fuel for district heating not be used as a rationale for inefficient milling. Since appropriate supplies of wood close to some communities are dwindling, economic and environmental factors may make further wood-fired commercial heating projects challenging.

Other issues also need to be addressed. Biomass fuel technology is less convenient than oil, propane

During the late 1980s and early 1990s, Gunnar Nilsson's Sloughmill sawmill south of Whitehorse used planer chips from air dried stock to produce briquettes of compressed fuelwood. The briquettes, sold by the bag, were cylindrical and sized for hand feeding, like short pieces of log. People who used them found that they burned well and were less expensive than cordwood. Yukon government

Burning cleanly

Wood burns best when more surface area is exposed to flame. Bucking wood to lengths 10 centimetres shorter than the firebox and splitting it to 10 to 15 centimetres in diameter will make the best clean burning use of the energy in the wood.

In the Yukon, spruce and pine harvested as standing dead timber (disease or fire killed) are the most common fuelwoods. These woods, if stored out of the weather, provide excellent, low moisture-content fuel, well below the 20% moisture content called for by wood heating experts.

The burning cycle

Firewood goes through three stages when it is added to a fire:

1. Water evaporation: As new firewood is heated by coals or burning kindling, the heat energy first must boil off the moisture in the wood.

2. Smoke emission: Once heated above the boiling point of water, the wood produces smoke — vaporized combustible gases and tar droplets — that burns with the bright flames commonly thought of as fire.

3. Charcoal phase: Finally, charcoal, almost 100% carbon, burns with a red glow and little flame or smoke since most of the gases and tars have vaporized and burned.

Flash and extended fires

The heat and duration of a fire depend on the amount of fuel, its size, and the surface contact with combustion air. In modern, approved woodstoves, it should not take long to get a flash fire going to take off the chill. At the same time, there should be no problem getting extended burns, so long as the wood is loaded appropriately.

Flash fires use small, loosely stacked, crisscross fuel loads with a minimum of three pieces to sustain the fire. They burn quickly because combustion air can reach most of the wood at once. Opening the air inlet encourages a hot, bright fire.

Extended fires need compact fuel loads where larger pieces of firewood are stacked closely together. This limits the surface area of the wood that is initially exposed to heat and flame and saves the interior of the pile for later in the burn cycle.

Opening the air inlet fully for the first 15 to 30 minutes of burn time chars the exterior of the fuel load. Then, turning down the air control sustains a clean burning fire that is not smouldering.

The suggestions made here work for many wood burning appliances, but some combustion systems, especially catalytic stoves and masonry heaters, may require specific firing techniques. Check the operating manual for your stove for detailed firing instructions.

NEVER burn:

- wet or green wood
- household garbage like plastic, cardboard or glossy magazines
- painted or stained wood, pressure-treated wood, particle board or plywood

Measuring air quality

Operating a P-TRAK to find tiny particles not detectable using conventional instruments. Marten Berkman

If you are concerned about the air quality in your home because of owning a woodstove, check it out using a P-TRAK monitor. The P-TRAK measures ultrafine particles in the air. Up to 70% of particles found in the air are so small that they are essentially invisible. The other 30% are fine particles or the dust you notice in a beam of light.

A qualified P-TRAK operator can identify sources of ultrafines and advise how to manage them. Call the Energy Solutions Centre to connect with a qualified technician.

or electricity. Biomass fuels, such as wood chips, require more handling, and fuel supplies and delivery systems can be inconsistent. Heating systems operators must be committed to the technology and the additional work it entails. Unless there is a strong institutional commitment, users are likely to fall back on conventional fuels to supply their boilers.

Although the number of users and suppliers of biomass technology has declined in Canada over the past decade, today, concerns about global warming and the search for alternatives to fossil fuels are kindling new interest.

Continuing research

As recently as 1999, the Yukon government partnered with Autumn Industries, a British Columbia company with Scandinavian partners, to prepare a series of feasibility reports looking at the possibility of wood-pellet district heating systems in the downtown, Takhini and Yukon College areas of Whitehorse.

The reports concluded that Yukon College and downtown projects would be feasible, factoring in the social and economic benefits of employment created. However, on a straight economic cost basis they were not practical and there were questions about sufficient fuel supply, so the proposals remain on the shelf.

Wood energy can also be used to generate electrical power as it was at the Cattermole Sawmill in Watson Lake during the 1980s. Subsequent mill operations there, as well as Dakwakada Forest Products in Haines Junction and Selkirk First Nation in Pelly Crossing, have studied the feasibility of using waste wood or fire-killed wood to generate electricity.

The Yukon's remoteness, the cost of imported fuels and the availability of fire-killed wood mean that there will likely be continued interest in commercial-scale wood heating and electricity generation. However, distance of fuel supply to communities may be a limiting factor.

The future of wood

On the domestic heating front, woodstove usage has varied over the years. Bert Wolfe noticed that there was a downturn in woodstove sales after the Canadian Oil Substitution Program ended. Some people, tired of the hassle of dealing with wood, turned to oil or propane, while others installed high efficiency oil space heaters.

But now, with oil and propane prices rising and the availability of EPA-certified woodstoves (operating at 70% to 80% efficiency), people are once again buying woodstoves.

Today's new woodstoves have done much to deal with the health and air quality concerns that gave rise to certification standards. They burn wood cleanly, reach normal operating temperatures quickly and emit little smoke after that.

Whether wood-fired central heating systems will enjoy the same popularity is not yet clear. Wolfe says his business still sells only one central heating wood boiler or furnace for every 10 or 15 woodstoves.

Regardless of the kind of appliance in which it is used, wood energy has been part of the Yukon picture for thousands of years, and has the potential to remain a good choice to heat our homes, if we take care to use it properly.

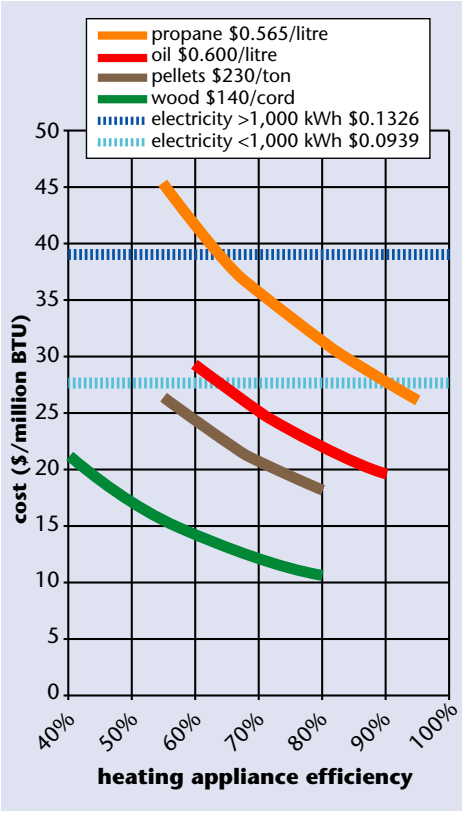
Both in the Yukon and in the rest of Canada, air quality remains an issue in populated areas where older woodstoves are being used. Although a number of states in the U.S. have regulated woodstove emissions by banning uncertified stoves, in Canada, only British Columbia has prohibited the manufacture and sale of woodstoves that are not EPA-certified. Some municipalities, like Whitehorse, insist that all new or replacement woodstoves meet EPA standards for efficiency and emissions.

The Yukon's energy solutions group of companies — Yukon Development Corporation, Energy Solutions Centre and Yukon Energy — have been paying close attention to wood energy developments on the local and national scenes. They have also been helping to shape them.

Burn it Smart

The Yukon, along with the rest of Canada, has taken a public education approach to the emissions problem. Burn it Smart is a national wood heat

This combination of a wood pellet furnace with a backup oil furnace is a good heating setup for the owners who like the steady, even heat from wood. The pellet furnace burns very cleanly and generally requires little maintenance apart from daily loading of pellets. The pellets are made of sawdust-sized wood particles. The resin in the wood liquifies under pressure, binding and forming the pellet. Pelletizers can use a variety of sawmill wastes, so long as bark is a very small proportion (less than 5%) of the feed material. Peter Long



A comparison of the relative residential heating costs for different fuels, October 2002. In the Yukon, a modern, 185-square metre, R2000 house uses about 100 million BTUs per year. A 4-bedroom Riverdale home built in the 1970s (2 x 4 construction) might use 200 million BTUs. Only a very small R2000 home would use as little as 50 million BTUs. Yukon Housing

education campaign sponsored by Natural Resources Canada (NRCan) in partnership with the provinces and territories, industry, and non-government organizations such as the Yukon Conservation Society.

Burn it Smart deals with air quality issues by informing the public about new, high efficiency certified woodstoves and teaching how to reduce waste and emissions and how to burn hot and safely. As well, it creates information and education materials for the public.

A representative of the Yukon Development Corporation, Cathy Cottrell-Tribes, sits on the steering committee for Burn it Smart. When NRCan set up focus groups to research wood burner attitudes towards wood heat, there was a Yukon focus group and NRCan researchers heard directly from Yukoners who heat with wood.

Lighting a fire

Crumpled newspaper, dry, finely split kindling and seasoned, split firewood make igniting a hot, clean fire in your woodstove straightforward.

Bottom-up ignition

This traditional method calls for an open draft, plenty of crumpled newspaper, 10 to 15 pieces of dry, finely split kindling and seasoned firewood.

1. Loosely stack the kindling on top of crumpled newspaper near the combustion air supply to the stove (usually at the front of the firebox) and put two or three small pieces of firewood on top of that.
2. Fully open the air control and light the newspaper in two or three places near the air supply vent.
3. Close, but don't latch the door until the paper is flaming brightly and continues to burn that way when the door is latched. Do not leave the appliance if the door is not latched.
4. When the fire is established, add small pieces of firewood on and behind the burning kindling.

Top-down ignition

Top-down firing is a new approach to kindling a fire that some wood burners swear by. It still calls for crumpled newspaper, dry, finely split kindling and seasoned firewood.

1. Place two or three larger pieces of firewood at the back of the firebox.
2. Lean 10 to 15 pieces of kindling against the logs.
3. Place several crumpled sheets of newspaper on and around the kindling.
4. Set the air control to fully open, light the newspaper and close the loading door.

Converts to this method claim that it produces minimal start-up smoke, cannot collapse and smother itself, and does not have to be re-fuelled once the kindling fire is established.

Re-fuelling a fire

As a fire reaches its end stages, it leaves a bed of glowing coals near the back of the firebox.

Raking coals forward when you refuel your stove means that ashes accumulate at the front of the stove. Ideally, to avoid a mess, ashes should be removed daily before lighting. (Upon removal, the ashes should be placed in a non-combustible container and stored outside, away from combustible materials.)

Place new firewood on and behind the coals (three pieces of wood minimum; five or more, better).

Open air inlets fully and close the door.

Let the fire burn brightly for 15 to 30 minutes — until it has charred the new fuel load.

Reduce the air supply in stages to a level that generates the heat you need. A sudden reduction in air may make the fire smoulder until it recovers.

Starting a fire. Peter Long

Dev Hurlburt of Hurlburt Enterprises has created a market for salvage wood from clearing projects and disease-killed forest. His $80,000 fuelwood processor, located outside of Whitehorse, is capable of handling three logging truckloads of 12-metre lengths a week. It cuts, splits and piles, producing 15 cords of stove-length fuelwood per day. Hauling wood to the processor in tree lengths means reduced transportation costs and allows Hurlburt to supply the Whitehorse wholesale and retail markets economically. Wood from Marshall Creek and the Alaska Highway clearing near Champagne has made up the bulk of his supply to date. Peter Long

In the fall of 2001, when NRCan established a woodstove changeout pilot program, the Riverdale Woodstove Changeout program was one of eight projects in all of Canada. It helped homeowners to replace old, inefficient wood burning appliances with new, high efficiency stoves, or simply to remove them. The pilot program also taught homeowners good burning practices to reduce emissions and increase efficiency.

In the winter of 2002-2003, Craig Olsen of the Energy Solutions Centre (ESC) is coordinating workshops on wood heating around the territory. These will focus on better burning techniques and encourage people to get the maximum energy out of their wood pile.

ESC continues to offer Wood Energy Technology Training workshops.

Other initiatives

At the national level, reviews of federal legislation such as the *Canadian Environmental Protection Act* and the *Hazardous Products Act* have concluded that a nation-wide regulation for wood burning appliances could be developed under the latter act. Current plans contemplate banning all sales and manufacturing of non-EPA- or CSA-approved woodstoves across Canada in 2005.

In the meantime, working with other levels of government from across Canada, Cottrell-Tribes is helping to develop a municipal burning bylaw template to make it easier for communities to respond to specific burning problems. Her work involves researching legal approaches employed across the continent to identify the most effective and least intrusive solutions to protect local air quality.

Wood is here to stay

Wood is a local energy resource that meets close to a quarter of our residential space heating needs and reduces oil and propane imports that draw money out of the Yukon economy.

By working with both local and national partners, the Yukon's energy solutions group of companies is contributing to better burning and a healthy environment.

Bert Wolfe expects to be selling woodstoves for a long while yet — almost all of them high efficiency models. He is sure that wood is here to stay. "There will always be people who burn wood," he says.

Yukoners have always been proud of their self-sufficiency and protective of their environment. Better heating with wood treats these traditions with respect.

Passing on a tradition

Cathy Cottrell-Tribes: "I grew up with the cozy warmth of wood heat provided by many, many editions of the barrel stove....I still enjoy that soft radiant heat and the sight of the dancing flames through the glass door of my modern stove. I also congratulate myself that I am able to keep my kids comfortable through the long Yukon winters using a CO_2-neutral, local, renewable, small-scale and decentralized fuel source." Peter Long

Yukon's energy solutions group of companies

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