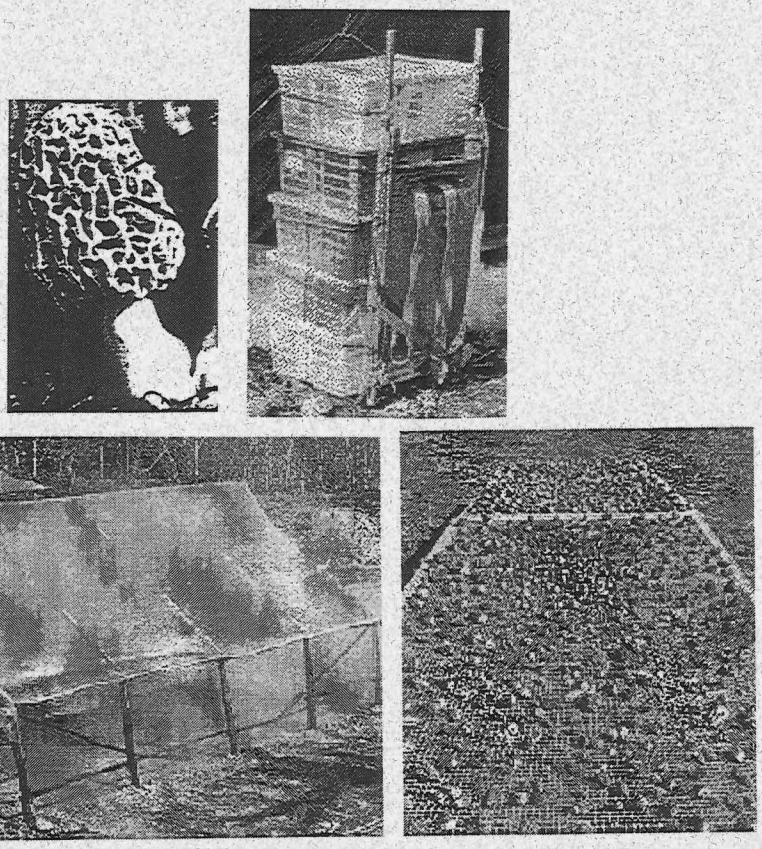
An Overview

of the

Yukon Morel Mushroom Industry



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Yukon
Economic Development

Yukon
Renewable Resources

An Overview

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Yukon Morel Mushroom Industry

prepared for

Government of Yukon
Dept. of Economic Development
Dept. of Renewable Resources

by

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CAUTION:

It must be emphasised that some mushroom species are difficult to identify and may be poisonous. (see pages 4&5) No harvesting or consumption of mushrooms should be attempted unless the identity of the mushroom is confirmed by an appropriate scientific authority.

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Contents

1. INTRODUCTION

1.1 Purpose

The purpose of this project is to conduct an overview of the current mushroom industry in the Yukon, identify key industry components and issues that are relevant for the Territory and make recommendations for work requisite to moving towards the development of an environmentally friendly and economically beneficial sustainable industry.

1.2 Background

The commercial morel industry is relatively new to the Yukon, but is increasing in magnitude and importance. Although the industry is largely undocumented, it appears more harvesters and buyers are doing business in the Territory in each successive year. The morel grows primarily in areas that have been recently burned, so with the extensive forest fires of 1995, it is expected that 1996 and 1997 will see accelerated activity in this industry.

The demand for this mushroom originates primarily in the gourmet kitchens of Europe and wherever French cuisine is practised. In North America, the industry had focused on meeting this demand through picking, drying and transporting the product out of the Pacific Northwest United States and British Columbia. Each year more operators continue expanding northwards in search of new supply areas, and it is this expansion which has led to increased interest in the Yukon.

The morel industry in the Territory has the potential to be significant in regards to both its environmental and economic impacts. From the economic perspective the industry employs a significant labour force and offers lucrative opportunities for local business development. From an environmental perspective, the industry also presents a number of issues. As an unregulated industry there are no enforceable checks on sanitation, litter or environmental damage to forest ecosystems.

There is significant potential for growth in the industry in the Yukon and if developed properly, it may provide sustainable economic returns without detrimental environmental impact. If not developed properly, it has the potential to become a major environmental problem resulting in conflicts and few benefits for local people.

1.3 Study Methods

This study includes the results of literature research and interviews with key industry members (some people interviewed preferred to remain anonymous), in addition to personal knowledge of the industry in the Yukon, B.C., Europe and Asia. It is not intended to be a conclusive statement on the morel industry, but rather a starting point from which further discussion, research and understanding may evolve. It is to be taken within the context of the greater botanical forest industry developments in N. America, of which the morel is only one, but a significant part.

2. BOTANICAL PROFILE

2.1 Family Morchellaceae: Botanical profile of genus Morchella.

Trying to classify morels has been, and continues to be a problem for the world of Science. The Peterson Field Guide To Mushrooms of North America", by K. McKnight, pointed out in 1987 that "the species is so variable that it is not known how many species pass under this name; there is little agreement on the subject among either professional or amateur collectors."

In 1994, B. Bunyard of Penn. State University's department of Plant Pathology published an article in Mycologia entitled "A Systematic Assessment of Morchella using RFLP Analysis of the 28S ribosomal RNA gene" in which he notes:

> "Because environmental conditions can cause members of the genus to vary morphologically, the number of species has been disputed. Some authors classify the genus into three to five species, while others argue for as many as fifty species. More genetic variation may occur between geographically isolated populations of the same species than between two putatively distinct species."

Scott Redhead of the Research Branch, Agriculture Canada, clearly one of the leading mycologists in the country, has highlighted in his introduction to A Biogeographical Overview of the Canadian Mushroom Flora that

> "the study of mushrooms in North America is faced with many difficulties. Mushroom taxonomy is approximately 100 years behind that for vascular plants. There is great debate over generic concepts and names, and species concepts themselves are often vague, just as they were for vascular plants 100 years ago. Within the. past 20 years the literature aimed at the amateur mycologist has overtaken scientific literature in many respects. Field guides give information on fungal distributions and other data not documented in the scientific literature. Precise information on the distribution of mushrooms is difficult to determine from the literature because of the mixture of useful data with misinformation based on misdeterminations, differing species concepts or the misapplication of names. There is even uncertainty about the ranges of some of our most common species!"

Sadly, Morels are not included in this overview.

Bunyard seems to have done some of the most dedicated work on the phylogenetic tree and his data suggests that Black Morels(*Morchella angusticeps, elata* and *conica*) and Yellow Morels (*Morchella esculenta, crassipes* and *deliciosa*) are separate taxonomic groups.

The taxonomy set out by Bunyard will be used for this study, primarily because the majority of the guides/literature acknowledge *Morchella conica* and *elata* as Black Morel, and *Morchella esculenta* and *deliciosa* as Yellow Morel.

"Esculenta" and "conica" are the terms most heard in Yukon camps, however the morphological variation in a kilo of these morels would leave the most ardent mushroomer hard pressed to classify them even into two species. Some European companies also distinguish, in theory, between conica and esculenta, but it should be noted that these individuals may have only rudimentary criteria for classification.

Synthesizing from a number of guides, here is a general profile of *Morchella esculenta* and *M.conica*.

MORCHELLA ESCULENTA : YELLOW MOREL

Fruit Body: 5-15cm tall, rounded to elongated spongelike structure; pits of the sponge very irregular, lacking vertical arrangement. Ridges are pallid at first, with pits smoky brown-grey; as fruit body matures the cap flushes yellow-ochre as a result of the mature spores. Cap and stem fused.

Stem: 40-80 X 20-50mm, often enlarged, swollen at base, hollow, white to pale cream.

Spores: ellipsoid, smooth 20-25 X 12X16 microns

Habitat: various, old orchards, under dying hardwoods, gardens, roadsides, quarries; abundant in disturbed or burned-over soil.

Season: in N. America - Feb-July

MORCHELLA CONICA : BLACK MOREL

Fruit Body: 4-7cm tall, 2.5-4cm wide, head ovoid to conical, tending to be very narrow and pointed as it dries; surface olive-grey to grayish-tan or moderate brown, becoming blackish in age. Cap and stem fused.

Stem: 2.5-4cm long, 1.5-2.5cm wide, narrow, hollow, cylindrical, usually enlarged and slit at base.

Spores: ellipsoid, 20-25 X 12-14 microns, thin walled, smooth.

Habitat: Scattered in forest areas, especially conifers in the Rocky Mts., often in disturbed areas, after a burn; tends to fruit earlier than *Morchella esculenta*, although seasons overlap.

Season: Feb-Aug

2.2 Multilingual Nomenclature

ENGLISH	LATIN	FRENCH	GERMAN	JAPANESE
	M. angusticeps			
	M. elata	Morille Noire		
Black Morel	*M. conica*	Morille Pointues	Spitzmorcheln	Amigasa-dake
Yellow Morel	*M.esculenta**	Morille Jaunes	Speisemorcheln	Amigasa-dake
	M.deliciosa			
	M.crassipes			

*aka. Common Morel

Note 1: Under Latin, "M." stands for the genus *Morchella.*

Note 2: It is important not to confuse *Morchella esculenta* with *Gyromitra esculenta.* The latter is poisonous and discussed in section 1.3.

Note 3: the German "Spitz"-morcheln means "pointed" morel and "Speise"- means "food" morel. The Germanic cuisine tradition of using morels is the oldest in Western European writing. The English word "morel" is derived from Old High German. During the Medieval period there is documented evidence of German country women specifically burning areas of forest to stimulate morel growth. (R. Mabey Food For Free 1972)

Note 4: The Japanese "Ami-gasa-dake" means the mushroom which looks like an Amigasa, the traditional braided sedge hat.

2.3 Problems In Field Identification: Mycotoxins and Poisonings

As has been pointed out, there is great debate in classification of the *Morchella* species. The problem in the field is the similarity between edible morels and two other species, being (a) ***Gyromitra esculenta***, aka False Morel, and (b) ***Verpa bohemica***, aka Early Bell Morel, aka *Morchella Bispora*, which according to Edible and Poisonous Mushrooms Of Canada by J.W. Groves and Scott Redhead, are found in the same habitat at the same time of the year. Both of these species have been known to cause death among some individuals, yet apparently can also be consumed as a delicacy by connoisseurs who have no reaction to them. Successful digestion of these dubious cuisine mushrooms may be partially dependent upon the intensity of heat the mushroom receives during preparation. Some older European recipe books suggest **blanching morels for a minute in boiling water** before they are dehydrated for storage (R.Mabey, Food for Free, 1972) . This historical blanching procedure may have been a double safeguard against the toxic effects of look-alike false morels, and

to lessen the negative effects of genuine morels when eaten less than fully cooked with alcohol. Clearly some individuals are more mycotoxin tolerant than others.

Some guides note that some species in the genus *Verpa* may be lethal due to accumulative consumption. *Gyromitra esculenta* has had a number of deaths attributed to it in the US. It apparently classifies as protoplasmic poison, resulting in generalized destruction of cells, followed by organ failure (usually liver, kidney or heart) according to the US Food and Drug Administration Centre For Food Safety Foodborne Pathogenic Microorganisms and Natural Toxins 1992. It may also in some people only classify as a gastro-intestinal irritant producing rapid nausea, vomiting abdominal cramping and diarrhea. Paradoxically, it remains a delicacy for some people and Scott Redhead notes having seen it for sale in Finland.

Besides qualifying as a protoplasmic poison., there is overwhelming evidence of *Gyromitra esculenta* being highly carcinogenic due to the presence of certain hydrazine compounds. (Slanina, P.,1993) (Toth, B 1994) (Gecan, J. 1993) These hydrazines have been shown to cause external and skeletal malformation in the foetus, thus pregnant women should be cautious about practicing exotic mycophagy. (Mycophagy refers to the eating of mushrooms in general, and the eating of wild fungi in particular.)

Poisonings

A two year survey conducted by the US Food and Drug Administration showed that **21% of morels on the market were contaminated with toxic look-alike species.** In 1993 the FDA issued import alerts for morels contaminated with *Gyromitra esculenta* and *Verpa bohemica*. Around the same time Illinois passed a state regulation prohibiting the sale of wild-picked mushrooms through retail outlets, and Michigan State brought in regulation requiring licensing of harvesters of wild mushrooms.

Interviews with Dr. J. Bigham of the Vancouver Health Dept., Inspector George Eng of the V.H.D. and Professor R. Bandoni, U.B.C. mycologist (pers. comm.) revealed a graphic tale of mass morel poisoning. On June 8, 1991, 482 guests sat down to a banquet at the Vancouver Hyatt Regency including wild marinated raw morels. They had been marinated in wine. Within 20 minutes of ingestion, 77 guests were experiencing nausea, cramps and bloating. Dr. Bigham described the scene as "awash with vomit". Symptoms including diarrhea, a hive-like rash, clamminess and numbness of tongue, persisted for three to seven days.

The morels were identified as *Morchella esculenta* and *M. angusticeps*, and the V.H.D. issued an immediate press release warning against consuming Black Morels with wine. Further investigation revealed what Europeans have known for centuries: **morels are never eaten raw with alcohol.** Morels thus qualify as either disulfiram-like toxic mushrooms, or gastrointestinal irritant mushrooms, WHEN CONSUMED RAW WITHIN 72 HOURS OF ALCOHOL.

2.4 Habitat and Occurrence in the Yukon

Very little is known with certainty about the biology of morel habitat. In a 1992 article in the French journal Cryptogamie Mycologie, Cytochemist F. Buscat from the Bundesforschungsanstalt Landwirtschaft concludes that:

> "Morels have two ecological strategies. They can establish ephemerally as pioneers and saprophytes on recently disturbed soils. In stable ecosystems, they establish and fructificate durably, as they contract a double saprophytical and ectomycorrhizal association with plants. The spores produced every year within this latter strategy allow the ephemeral colonisation of disturbed sites by the fungus."

It would appear that in the case of the prolific fruiting on burns that the colonisation was modestly present in the summer of the burn; in the following spring the vast decline of competition from other plants allows for maximum exploitation of the available nutrients and water. Morel colonisation previous to the burn is likely dependent on the above mentioned symbiotic association with certain plants - certain trees in particular. L. Duchesne of the Petawa Nat'l Forestry Institute, Chalk River, Ontario, wrote that in May 1991 that *Morchella conica* "were observed at a density as high as 2860kg/ha in a *Pinus banksiana Lamb.* stand, singly or in clusters within a radius of 2-3m around dead *Pinus banksiana* trees but not around dead specimens of *Pinus resinosa Ait.* and *Pinus strobus L.* "

Several references have been found to morel's ability to reproduce abundantly for up to three years on the same burn site, with a diminishing proliferation on each succeeding year; no data exists on diminishing biomass rates.

Fruiting appears to be triggered by the appropriate combination of temperature and water; fruiting in southern alpine conditions can coincide with more northerly locations at lower altitudes.

Data on (a) morel preference for ectomycorrhizal species association in the Yukon, (b) rates of diminished fruiting on the same burn in the Yukon, (c) Yukon temperature and water statistics associated with fruiting and (d) altitude limitations for Yukon habitat are not in print .

There appears to be no scientific literature dedicated to the Yukon morel. However, a number of references and observations allow us to draw a rough profile in regards to preferred habitat and occurrence in the Yukon. In ruling out the availability of deciduous hardwoods for symbiosis associated with morels in Eastern N. America we are left with a mushroom preferring conifers (especially Spruce *Picea*) for association. It is interesting to consider Dr. Duchesne's 1992 observations in the Canadian Field Naturalist publication of his article_ "High incidence of *Morchella conica* in a Jack Pine *Pinus banksiana* forest following prescribed burning". It is noted that Ontario morels "occurred in a 2-3 metre radius around dead *Pinus banksiana* trees but none occurred in the neighbourhood of dead *Pinus resinosa* and *Pinus strobus* trees. *Morchella conica* were not observed in the surrounding unburned forest."

Beyond an apparent preference for certain conifers (Yukon conifer preference is undocumented) we know they prefer to fruit on burns. The rationale for this is largely undocumented, however the following points apply to the Yukon burns. Morel fruiting body formation occurs in spring following a summer burn, so one can assume fruiting may result from fire stimulation of pre-established mycelium in the forest floor. Fruiting by phoenicoid (burn preferring) fungi has been shown to be stimulated in heat-treated substrates (Carpenter, S. Canadian Journal of Botany 65 1987). Several sources suggest that the effect of heat may stimulate ascospore germination, reduce soil concentrations of substances inhibitory to fungal growth, destroy competing organisms and alter soil pH and carbonate concentration. (Carpenter,1987; Wicklow, D, 1975 Mycologia 67; Wicklow and Hirschfield 1979 Mycologia). In other words, forest fires in the Yukon create the ideal conditions for morels.

In the light of total absence of published data on morel preference for Yukon soil types and altitude one can be guided by a reassuring observation: Yukon morels occur in abundance in the spring following a summer fire in a coniferous forest.

Refining that somewhat, it has been observed that concentrations are higher on southerly and south-westerly slope aspects; this is likely due to higher ambient soil temperatures. In an interview with Dr. Tom Volk (who did Ph.D. work on morels) of the University of Wisconsin's Centre for Forest Mycology Research he laments:

> "I have seen no hard data on specific temperatures. I know that several warm nights are required, as well as adequate moisture ("adequate" is presently undefined due to lack of data)....They like disturbances a lot for fruiting. In my opinion if there is a mycorrhizal association of *Morchella* with trees it has not been rigorously proven. If it exists it is certainly facultative rather than obligate, since the mycelium can be very easily grown on almost any substrate."

3. FOOD VALUE ANALYSIS

What is or is not significant in terms of food composition, carbohydrate fractions, inorganic constituents or vitamin content is a very subjective matter, largely dependent upon one's cultural norms, world view, and personal philosophies. For example, the way the Japanese traditionally evaluate the matsutake is very different from the Western scientific nutritional analysis presented here. The traditional Japanese and Chinese approach to the morel is not within the scope of this overview, but it is clearly a topic of research which should be pursued.

It is also unclear what the traditional Yukon First Nations food (or pharmaceutical) use of the morel was. (Another vein of research to be investigated would be a collection of oral accounts of Yukon morel food use within living memory.) It is unlikely that archaeobotanical accounts of prehistoric *Morchella* exploitation will surface: morel spores, measured in microns, are too small to be isolated accurately through flotation techniques.

The following is the most detailed data available on mushroom food value analysis, taken from The Composition of Foods (McCance and Widdowson 1993). It should be noted the even the most prestigious authority on food value analysis does not identify the species of mushroom in question, so it should be assumed that this is not morel, but rather a widely available domestic species. Obviously the appropriate analysis on *Morchella* is still needed.

3.1 Food Composition: per 100 grams

92.6% water
1.8% protein
0.5% fat
0.4% carbohydrate

100g provides 13kcal and 55kJ of energy value

3.2 Carbohydrate Fractions; per 100grams

0.2% starch
0.2% total sugars

individual sugars:

0.1% glucose
0.1% Fructose
0.1% Sucrose

fibres:

2.3% dietary fibre(after Southgate method)
0.2% cellulose
0.2% soluble Non-cellulosic polysaccharides
0.7% nsoluble Non-cellulosic polysaccharides

Trace elements of lignin

3.3 Inorganic Constituents: per 100 grams

5mg Na
320mg K
6mg Ca
9mg Mg
80mg P
0.6mg Fe
0.72mg Cu
0.4mg Zn
69mg Cl
0.1mg Mn

3.4 Vitamin Content: per 100 grams

0.12mg E
0.09mg Thiamin
0.31mg Riboflavin
3.2 mg Niacin
0.3 mg Trypt 60
0.18mg B6
44 mg Folic acid
2 mg Pantothenate
12 mg Biotin
1 mg C

3.5 Dehydration/Rehydration

Dehydration - Reports of a 10:1 ratio weight reduction are standard for drying morels in the Yukon. That means that, for example, ten kilos of fresh mushrooms will be reduced to only one kilo of dry mushrooms!

It is significant that pickers notice how quickly morels harvested in the morning will dry in the bucket by evening. Some pickers have been known to immerse their morels in water in order to rehydrate them before they are sold at the buying station by weight. This practice is not condoned as it is assumed to deteriorate the quality of the mushroom, especially in the area of bouquet integrity, and is simply done to maximize morel weight at the buying station scales.

Rehydration - Exact statistics on rehydration from McCance and Widdowson of the British Ministry of Agriculture, Fisheries and Foods show a 1:5.42 ratio. That means that the one kilo of dry mushrooms from above will swell to about five and a half kilos when soaked in water. The difference of ratio between dehydration and rehydration is presumed to be due to irreversible cell collapse during dehydration. According to morel retailers Sabaret-Wassner of Brives, France, 10g of dried morel per person is the recommended serving portion. That would convert to 54.2grams of morels per serving after rehydration, or slightly over one ounce per person. As that serving sits on your plate, it would appear about the size of a small handful.

4. GASTRONOMIQUE

4.1 The French Perspective:

The morel is the most highly prized wild mushroom in French cuisine. It is perceived in the mind of the chef as both rare and expensive. It is regarded as having an exquisite smoky bouquet, and as a spring mushroom , it carries with it all the associations of rejuvenation.

According to the Larousse Gastronomique (the respected culinary encyclopedia) the morel is "a very tasty but rare mushroom, it must be very carefully cleaned with a fine brush so as not to destroy its delicate scent. Morels with dark caps are the most highly prized ones. All morels should be well cooked." The classic dish is **Morille a la Creme**, where the morels are braised in butter, with onions, salt, pepper and lemon for 5 minutes, before being covered in hot cream. Variations appear on the menus of all first class hotel dining rooms and fine restaurants throughout France, Switzerland and Belgium. It is not unusual to encounter, for example, an $80.00CN plate of pasta covered in Morille a la Creme in Belgium with only three small morels!

The world of French haute cuisine is taken very seriously. One connoisseur in Geneva, Switzerland reported having been able to **taste** insect repellent from a picker's hand during the sampling of a batch of Canadian morels. Generally however, Canadian mushrooms are widely respected in Europe as being of extremely high quality. In particular they are recognized as being free from pollutants, including radioactivity. It was concern over radioactivity in wild mushrooms tainted by fallout from the Chernobyl nuclear disaster in 1986 which initiated the search for alternative sources. The French cuisine market continues to prefer Canadian mushrooms for their purity.

The psychological effects of the Chernobyl disaster still linger in the marketplace. In 1992, E. Vasazari of the Budapest Civil Defence Laboratory conducted a study entitled "Determination of Radioactivities in Some Species of Higher Fungi" . Samples from the Pestszentloric pine forest in Hungary included *Morchella esculenta* as one of 22 test species, and proved to be contaminated with Potassium40, Cesium137, Cesium134, Silver110 and Strontium90. The author concluded "it was found the uptake of Cesium isotopes in mushrooms is higher than the other green plants."

Bouquet is an important part of morel culture. The University of Bourgogne Dept. of Microbiology conducted a study of morel **bouquet** in 1995 pursuing the idea of extracting "pleasant odorous substances" from the mycelium biomass. A "sniffing evaluation" in addition to a chromatographic profile analysis (chromatography profiling is the science of illustrating odours) showed that in the characterisation of aroma as "fruity, woody-musty and flowery" *Morchella crassipes* was most odiferous. This is the only reference encountered supporting the idea of harvesting wild mycelial biomass for producing an aroma concentrate for use in enhancing dried, processed, prepared morel products such as soup mixes or snack chips.

4.2 International Perspectives

French cuisine is a cultural export; it is a world renowned luxury and has taken root in all the upper classes of the industrialized nations on the globe. It is imported to countries, as Japan for example, as a respected entity, and flourishes there as one of the flowers of foreign culture. From the international perspective, reproducing French cuisine is a study of high culture, and hence its study has been institutionalized in major culinary schools like Cordon Bleu. As the pinnacle of development in European cuisine it will continue to be avidly consumed on a global scale. As the most highly prized of all the wild mushrooms, the morel is an excellent product to be developing for the future. The Yukon Territory is arguably the most pristine environment on the planet where wild morels can be harvested, so the Yukon morel seems to be well situated for greater international attention.

5. THE INTERNATIONAL CONSUMER MARKET

It is no surprise that the greatest consumers of French cuisine are the French. No statistics can be presented for total French consumption, but Swiss operators confirmed that France consumed the greatest quantity. They were quick to point out however that Swiss were the highest wild mushroom consumers per capita in the world, with 24 million kg (wet and dry) consumed annually by 6 million Swiss.

Although there are more German companies dealing with wild mushrooms than other European nation companies, Swiss operators confirm that business activity does not reflect internal consumption. German operators in Hamburg independently confirmed Swiss reports that the Germans function widely as international middlemen, facilitating distribution throughout Europe due to an advanced transportation system. The Germans are also heavily involved in morel processing, including chipping for soups and packaging for distribution.

National consumer tendencies are quite marked in Europe, according to a wide range of international operators interviewed. The French tend to spend more on luxury food and less on the material aspects of their lives. Germans prefer to spend their earnings on the visible signs of status such as their home and their car, but will do so at the expense of luxury foods inside the home. This national tendency for overt celebration of exquisite cuisine on the part of the French culture even manifests itself in art. In 1987 the French were the first to release a postage stamp depicting *Morchella esculenta*. Canada did the same in 1989.

There appears to be an international trend towards consuming wild mushrooms, possibly fueled by the preference for eating food free of agri-chemicals, or the idea that ingesting wild food somehow brings the individual closer to nature. Swedish researcher L. Kardell observed in the 1980s that Europeans associated wild harvested mushrooms with a sense of security against the feeling of alienation from nature which many felt was creeping into their lives.

The best word to describe the global market dynamic for morel volume might be **erratic**. Unpredictable world events have set the rhythm for the European morel distributors. There are no comprehensive statistics by nation kept on morels, probably because as a wild harvested commodity nobody can predict consumption, so nobody tries - distributors raise the price when supply is low and the market drives the price lower when harvests are bountiful. As a marginal food industry, there is no tradition of documentation beyond each company's territory - and these are carefully safeguarded.

Beyond calling the international morel market erratic, it can be said it is primarily driven by a European consumer population less and less able to supply itself from within. Based on documented evidence of myco-flora population decline by E. Arnolds (in J. Cherfas 1991) it is no surprise European operators agree they are obliged to rely increasingly on foreign imports. Unfortunately percentages can only be guessed based on rumours and price fluctuations and this is only on a year by year basis. One should never lose sight of the fact that prices may fall, but there has never been any indication of European buyers refusing to buy morels.

5.1 Europeans

5.1a) **Swiss**

Swiss trade statistics show that a total of 2,000 tons of edible mushrooms were imported out of which 60.8 tons (60,800kg) came from Canada at a value of approximately $5.5CN million. The above statistics indicate an average price of $83CN per kg for *all* wild mushrooms, both wet and dry. Main suppliers to the Swiss market were France, Austria, Poland, Germany and Turkey.

It should be noted that "suppliers to the Swiss market" means from where they were last imported, not where they were grown. Hence "French" mushrooms may have been exported from Vancouver to Paris after having been harvested in Oregon USA!

There are an estimated 5 Swiss companies buying wild morels from an estimated 5 Canadian Companies. Each Canadian exporter could feasibly service a contract with each Swiss importer.

5.1b) **French**

French trade statistics indicate a general slump in the 1995 French economy. Of note to the morel industry was a total decline in dry morel imports from Canada. This was a notable trend in French cuisine - morel eaters chose to eat fresh product in season and eat less dry product out of season. Below is a chart detailing statistics of all mushroom species (including chantarelles, for example), which were imported directly from Vancouver to Paris. What exact percentage of these dollar figures represent morels is impossible to say, except it is known there is no French market for dried chantarelles, therefore it can be assumed that the "Dried" figures represent primarily morels. One must also remember that these figures do not reflect the fact that French buyers also purchased an undefined quantity of morels (dried and fresh) from other European sources, mostly Swiss , German, Belgian and possibly Dutch, some of which undoubtedly came from Canada. It is also important to remember that some of these figures will include mushrooms brought to Vancouver from the Northwestern States.

The complication of determining the origin of wild mushrooms, and the difficulty in interpreting the available data from an economic perspective underlines the need for a regulated system of both harvest and export data collection

All Canadian Wild Mushroom Species Imported Directly to France 1992-5

	1992	1993	1994	1995
BC origin 95% **Fresh** Wild	519,699	270,185	778,004	432,460
BC origin 100% **Dried** Wild	56,778	29,645	46,390	0

Figures are value in Canadian Dollars.

Nineteen Canadian wild mushroom exporters are listed in Paris by the Commercial Division of the Canadian Embassy, although certainly half of those listed are exclusively/primarily Matsutake exporters to the Japanese market. (Much of the commercial wild mushroom industry member information appears to be moving globally on CD-ROM , and at present is not always categorized by species) Twenty-five French companies import wild mushrooms.

It should be noted that morels face a 7.7% import tax levied on the importer.

5.1c) **British**

The U.K. imported over $5 Million CN worth of mushrooms between Jan-Aug 1995. Morels entering the U.K. arrive predominantly via Paris; perhaps only 5% of the above constitutes morel imports. Unfortunately mushroom statistics are not broken down by species in the available data from the Canadian High Commission in London, UK. Other species comprising that estimated 95% would be predominantly cultivated, common mushrooms.

5.1d) **Germans**

Forty two companies reported dealing with wild mushrooms. 1992 saw over $1 MillionCN value of wild mushroom imported from Canada; 1993 saw almost $900,000CN value of wild mushrooms imported.

5.2 Japanese

Data from Tokyo indicates six specialty importers handling morels. No separate data exists for morel imports as these are lumped together with matsutake; Canada exported 94,185kg in 1994 and 41,605kg in 1995. No dollar value is available with these figures.

In 1993, BC exported over 125,000 kg of pine mushrooms alone to Japan, for a value of CN$3,880,000. (deGeus, 1995)

5.3 United States of America

No data is available on national internal consumption levels. A brief investigation on the Internet of American eating habits concerning wild mushrooms would suggest that it is widespread, well known, considered fashionable and certainly increasing.

6. DOMESTIC CONSUMER MARKET

Canadians have traditionally been a conservative group with regards to food consumption patterns. Rapidly changing demography in recent decades has resulted in a more urbanized Canadian society and massive immigration has radically altered the profile of our cities.

Exposed to a full spectrum of international pallets, Canadians are adopting new trends. This consumer posture, coupled with the widespread gravitation to low fat, low calorie, environmentally friendly health food explains the emerging interest in wild morels.

It is unknown if face to face consumer market research has been performed to date with morels in Canada.

6.1 Canadians of European ethnic origins where morels are a status cuisine.

Dividing up the Canadian domestic market by ethnic lines can be difficult to say the least. However, having spoken to many of those who have European ethnic origins where morels are status cuisine (France, Belgium, Switzerland, Italy and Germany in particular) one quickly realizes that there is a market for wild morels, especially in the urban centres of Canada.

In 1995 an Italian-Canadian importer of Italian specialty food products for eighty Italian restaurants in Toronto was interviewed. He had been investigating N. American morels as an alternative to Italian-grown Porcini mushrooms, the traditionally preferred fungus. His problem was that somewhere en route from Italy to his Toronto clientele, the porcini became plagued with worm infestations. His restaurant management team agreed that Italian Canadians would accept morels as replacements because they were perceived as an expensive luxury food commodity like porcini, and that morels have been traditionally known in northern Italy. Although he knew they were being produced in U.S.A. and Canada, he had not been able to locate a supplier.

The French-Canadian market is an obvious one to be watching, and indicators are continuously surfacing that the demand will soon be increasing. 1994 saw the publication of La Cuisine Traditionnel Quebecoise in Japan by Hasegawa, including mushroom recipes. A recent arrival on the Internet Mushroomers On-line: Canada (compiled by the editors of Mycelium) page was researcher Simon Delisle of the Food Engineering Dept. at Laval University, Quebec, who says:

> "My field of interest is optimal growing of edible and economically viable fungi from the Quebec region."

A small study was also done in 1994 by Fernand Miron on the harvesting and marketing potential of wild mushrooms in the Abitibi- Temiscamingue region. As a micro project it appears to have been aimed at stimulating local consumption in order to provide local jobs. (Resources Naturelles Canada, Sainte Foy, PQ)

6.2 Other Canadians

Statistics Canada, Cat. No. 62-554, Table 1 of the Detailed Average Weekly Food Expenditures and Quantities, Canada, 10 Provinces, 1992, claims mushrooms are the sixth most popular out of the twenty fresh vegetables consumed on average by Canadians, and the fifth most popular out of the eleven canned vegetables. These statistics indicate that mushrooms are preferred vegetables and that Canadians are willing to pay for them. These are, of course, the common white domesticated mushrooms, produced overwhelmingly in mushroom-houses in Ontario and BC, close to the urban centres. It would be interesting to conduct polls at Ontario and BC grocery stores to determine how much consumers are currently willing to pay for wild Yukon morels.

6.3 Japanese Tourism Hot Spots In Canada

Certain locales in Canada have received the initial attention of the Japanese tourist, including Banff, Jasper, Niagara falls, Toronto, Quebec and PEI. These locations would potentially be appropriate test marketing venues for Yukon produced morel products.

Food items as gifts, especially mushrooms, are an established part of the contemporary Japanese economy. Wild mushrooms are even more highly prized, and it is well known that the Japanese tourist is famous for spending large sums on Canadian produced gifts at local shops.

What is less known is that the profile of the Japanese tourist is changing- with the strong yen, and relaxing social norms, more and lower wage earning Japanese are coming to Canada for longer vacation periods. Although they are familiar with BC's pine (matsutake), mushroom (in 1989 BC exported $11.6 million worth to Japan) there are no available alternative wild mushrooms on the gift market geared to the increasingly adventurous younger Japanese.

6.4 European Tourism Hot Spots In Canada

Certain locales have attracted the imagination of the European visitor including Quebec, Toronto, Niagara Falls, Banff, Jasper and coastal BC. These locations would also be potential test market sites for gauging European reaction to wild Yukon morel products.

Europeans come to Canada to hike and experience the natural environment which has been so devastated by overpopulation in the old countries. There are no wild mushrooms available as Canadian dried gift packages geared to the knowledgeable and morel-appreciating Europeans. International airport gift shop food shelves in Canada are stuffed with smoked salmon, maple syrup, mineral water and wild rice. These are all "wild" harvested products.

Recent studies commissioned by the Canadian Government in Europe indicate that wild mushrooms would fall into 3 of the 14 main food market growth areas: health foods, low-calorie alternative products and ethnic foods.

Europeans require their food suppliers to meet a number of criteria, the top three being **high quality** in terms of taste, ingredient, appearance, **strict environmental standards,** and **innovative product development** (The Produce Studies Group, 1995). By all these measures the Yukon morel has exceptional developmental potential.

6.5 Yukon Territory

The current market in the Yukon is unclear. During the entire 1995 harvest however, no restaurants were observed to be offering morel dishes, and numerous restaurants visited expressed no knowledge of the mushroom itself. Precise data on this subject is unavailable. Given the room for development in the local economy, the following is an idea worth considering.

The Yukon Territory would be an ideal venue for an International Morel Festival due to it being the most pristine morel-producing environment on the globe. Local restaurants could engage in a creative morel recipe competition, and the Festival could host an International Chef's competition, attracting representatives of major culinary schools. Prizes could include sizable quantities of Yukon Grade "A" morels. There are no known morel festivals presently in operation, however, other botanical products festivals are celebrated as annual community events, such as blueberry, Irish moss, potato, and strawberry.

Locally produced morels could bear the fire region name to distinguish the product: Carmacks '96! Adopting an official Yukon "Demarcation of Regional Origin" system similar to the European Wine and Cheese industry would imbue the Yukon morel with the distinction it deserves as a fundamentally world-class product. In Europe, "Demarcation of Regional Origin" systems are administered by Depts. of Agriculture or Industry.

Few foreign tourists brave the uncomfortable conditions of the maple syrup festivals in Ont/Quebec/NB in Feb/March, but the Yukon in June is much more tourism-friendly. Morel fruiting in the Yukon is also late enough - late June- that even BC would have difficulty competing for tourism oriented morel festivals because BC morel fruiting is much earlier.

7. INTERNATIONAL PRODUCERS

International producers of wild morels can not been conclusively identified for scientific and economic reasons. The discovery of morel habitat in new producer countries is ongoing, yet not always reported in the scientific literature. Unscrupulous European distributors have been caught marketing wild mushrooms in Belgium as "Canadian produce" in an attempt to conceal the true country of origin (anonymous).

7.1 Europe

Western and Eastern European morel habitat is under incredible stress due to intensive land use, over population and heavy industrial pollution. As has been noted Chernobyl contaminated traditional habitat where the Western Europeans had been accessing wild mushrooms, and these mushrooms continue to show levels of radiation as late as 1992.

The most striking debate in the scientific mycology literature of the results of polluted mushroom habitat is to be found in an article by in Science by J. Cherfas, entitled "Disappearing Mushrooms: Another Mass Extinction?" In this article, Cherfas discusses the work of mycologist E. Arnolds at the Agricultural University of the Netherlands.

> "A decline in (mushroom) population sizes has been occurring in Europe for a while now, and may be happening in the US. The current theory is that excess nitrogen in the air from pollution and farming are having the main impact on fungal populations. According to E. Arnolds, a fungal ecologist at the Agricultural University of the Netherlands, there is a negative correlation between abundance and diversity of fungi and the levels of nitrogen, sulphur and ozone in the air. How excess nitrogen affects fungi is not quite clear. It could be an indirect impact of pollution on the tree, not growing well, hence not nourishing a healthy crop of fungi, or the direct effect of nitrogen and sulphur in the soil, which Arnolds experiments show can prevent the fungus from forming an association with the tree. There is concern that unidentified fungal species may be going extinct in Europe."

High unemployment also forces pickers to harvest small or poor quality specimens in order to ensure a little money at the moment of discovery in the woods, knowing that if left unpicked to mature, someone else will take it before they return. According to Swiss dealers, this phenomenon is particularly acute in Poland , Latvia, and other Eastern European countries.

Sweden has been a source of morels for export to the European French cuisine market, but it is believed that the demand for Swedish products suffered somewhat as a result of Chernobyl . In the mid-seventies, the annual production of all wild mushrooms was 480 million litres, and as the total national consumption was

only 23 million litres, the Swedes were in a good position to export. It is unknown what percentage of the market the Swedes fulfill. In an article examining the conflict in Sweden over herbicide applications coinciding with mushroom harvests, L. Kardell notes that "clearcutting affects mushrooms and berries variously. All edible mushrooms, **except morels**, disappear after cutting for at least 10 years."

Author L. Malyi of the Belorussian Institute for Forestry published a study in a 1987 edition of a Russian forestry journal including *M.esculenta*. "Only 33% of mushroom reserves are used...it is suggested that special areas be selected for the purpose of collecting and processing these reserves, estimated at 52,893 tons." It is unknown if these figures refer to wet or dry product; the 33% quotation being "used" most likely refers to local consumption. Since 1987 the U.S.S.R. has collapsed, so it is assumed Belorussians are now relying on national mushroom reserves for self-sufficiency.

7.2 Asian

With regard to Asian morels, Western European companies complain about dirty specimens filled with sand, dead insects, twigs, and molds from the dirty shipping containers. Commerce is also plagued with shipments arriving extremely behind schedule, due to poor transportation infrastructure, incorrect invoicing, and associated business malpractice. General unreliability due to sporadic or chronic political unrest is also a complication.

7.3 South America

Argentina and Chile have been known to export some chanterelles to the French market. The Department of Ecological Science at the University of Chile recorded only in 1987 the existence of morels; several varieties were noted including conica and angusticeps. Some Canadian companies have expressed an interest in exploring the possibility of exporting from South America; this would require considerable initial research and development investment however ,and most Canadian companies would have difficulty embarking on such a venture. Because this is an unregulated industry, bankers remain dubious about providing loans to Canadian companies. Statistical information regarding the international market generally, and the South American market in particular is widely unavailable (or intentionally hidden), keeping investors somewhat in the dark about potential for profits.

7.4 United States

The American wild mushroom harvest industry is by far the most advanced anywhere. In 1992, approximately 1,800,000kg of wild mushrooms were sold in the US Pacific Northwest alone, with morel as the leading harvested species by volume at 590,000kg. The literature does not indicate wet or dry for these statistics, but it would be reasonable to presume these refer to wet mushrooms.

According to Schlosser and Blatner(1994) 10,400 pickers worked in 1992 and companies purchased $20.3 million US worth of all species, employing 520 workers in only processing and buying. The 1992 gross value of the whole industry in the US Pacific Northwest has been estimated at $41.1 million US. This figure is believed to include harvesting, buying, and processing.

8. CANADIAN PRODUCERS

Canadian producers are generally centered in BC, and are noted for having an advantage in dealing with francophone European dealers, who prefer to deal in French where possible.

8.1 British Columbia

According to DeGeus, 1993, 32,000kg (wet?) of morels were harvested in BC in 1992, despite low incidence of available burns, and unusual weather conditions. Also, "between 1986 and 1987 more than $200,000 was paid to morel harvesters in the Boundary forest district" (DeGeus,1995)

BC is clearly the most advanced province in Canada with regards to the harvesting industry of botanical forest products (BFP). In government they have been allocating research funds for some years to the monitoring of the industry, and their Forest Practices Code of BC Act now enables the future development of licensing regulations for botanical forest products. Their trained labour force is well adapted to working in the forest and excellent educational facilities provide for an academic human resource base to facilitate requisite studies.

BC's world class transportation system allows for successful competition with international producers. Reliable flights to Europe allow fresh mushrooms to be flown east, and as the gateway to the Orient they have gained a strong foothold in the Japanese market. Sharing a Pacific mentality and a long border with the US has allowed for huge intercourse with US mushroomers in various aspects of the industry.

While BFP opportunities for development are staggering, their potential for conflict with the timber industry is also great. The 211 recognized BFP currently being harvested in BC require healthy standing forests in order to be sustainable. There is concern over escalating tension between loggers and those seeking to glean income from an annually renewable BFP resource. As yet unregulated, the BFP industry faces a sophisticated timber lobby concerned with ensuring that timber remains the priority forest product.

Until sufficient baseline harvest data exists for morels, other wild mushrooms, and the hundreds of non-mushroom BFP, BC will be unable to realistically calculate the total value of its non-timber forest product inventory. The same challenge applies to the Yukon.

The 1995 BC morel harvest season was complicated by lack of rain, and thus similar dynamics existed as in the Yukon. Anticipation over perceived delay in fruiting in southern BC caused great anxiety in some camps.

Anxiety over fruiting failure, combined with rumours of a Yukon "gold rush" caused one buyer to take matters into his own hands. Although the buyer was directly employed by a BC shipper to buy from a burn in the Kamloops, the buyer panicked under pressure from pickers to move camp towards the rumours. About thirty people broke camp on a hasty decision and drove an entire propane equipped buying/drying station from Kamloops to Ross River YT. They established themselves

near North Lake and waited two full weeks until the first morels began appearing in early, mid June!

BC experienced 96 fires in 1995. Only six of them were over our arbitrary 1,000 ha "viable" level. The total area of these six burns is just over 40,000ha - about one quarter of the total area of the Carmacks area burns. The BC burns occurred in Ft. St. John, Mackenzie and Cassiar fire regions going from south to north. There is about 1,200 km of road between the Ft. St. John and Cassiar fires. The Ft. St. John fire is the most accessible, perhaps about 20 km from the paved highway, but it is only 1,000 ha. The four Cassiar fires total over 25,000 ha, but appear to be a lamentable 40 km from a rough Atlin road. Carmacks is beginning to look very inviting.

8.2 Alberta

It is not known to what extent Alberta based pickers are exploiting burns. In 1995, some BC companies evaluated burns in Alberta but it is unclear whether morel harvesting was pursued . No data is currently available.

8.3 NWT

The NWT Director of Conservation, Education and Resource Development, Dept. of Renewable Resources, has information on the NWT experience in morel harvesting, specifically relating to one Yukon based buyer who did some community presentations in an attempt to raise awareness about the industry.

The president of the NWT Mycological Association was interviewed and claimed the Association consisted only of several people who met irregularly, usually when a visiting mycologist arrived in Yellowknife from the south. She was aware that a Yukon based operator was encouraging Dene First Nation people to consider getting involved in harvesting on NWT burns. It was her understanding that Dene reaction to this initiative did not result in Dene involvement. She was not aware of any commercial harvest of morels in the NWT.

8.4 Ontario

Very little seems to be happening in Ontario regarding wild mushrooms, except for one recent study completed in Dec.1995. Dr. Luc Duchesne prepared a report entitled "Commercial Potential of Wild Mushroom Harvest in Renfrew Co.". The report is of interest in that it is the only available information from Ontario and it contains some striking data.

> "Current estimates show a European annual demand for $650Million and an annual Japanese demands in excess of $75million in wild mushrooms....To date there has been no large scale attempt at commercializing the wild mushroom harvest in Ontario because of a lack

of information about the abundance of wild mushrooms in Ontario's forests. However recent observations from experimental fires have evidenced the presence of the edible mushroom *Morchella conica* in large amounts leading to a market value of approximately $165,000.00/ha at the Petawa National Forestry Institute"(Duchesne and Weber, 1994).

Thirty two edible varieties were collected from August to October from three test sites; the total average harvest was 1547.5kg/ha/year (not including spring!) He points out that at current pulpwood value of $70/cord, Canadian forests produce a pulpwood value of $56/ha/yr in contrast to mushrooms at $80/ha/yr! The significance of this is that it means **there is quantifiably greater direct economic benefit from harvesting mushrooms than from pulpwood.** Duchesne also estimates that at $50/kg for mixed wild mushrooms, times the county land area 459,000ha, times the measured biomass production rate of 1.6kg/ha , that $36,720,000.00 annually could be generated in Renfrew Co. Of the 32 varieties collected, none were morels.

8.5 Yukon

Statistics from Fire Management, Northern Affairs Program, indicate there were 48 fires in 1995. The large scale commercially viable fires would be, according to size:

1995 FIRE NUMBER	HECTARES
*18 CA	57,650
*14 CA	56,831
*12 CA	50,142
8 CA	13,735
24 CA	3,906
10 DA	3,150
13 DA	2,200
19 CA	1,386
6 DA	1,062
*23 CA	819

Defining "commercially viable" is a very subjective term, depending on whether you are a company with large capital investment in equipment and immediate European orders to fill, or whether you are an individual who prefers to sun dry the morels and sell them over the winter on the internet, or somewhere in between.

The four fires marked with a star in the above table are those which appear on the rough map in Appendix B. These have been focused on for the very reasons that morel pickers coming to the Territory will inevitably choose to harvest on them. They have a balanced combination of preferred site qualities: large size, access via paved road, easy access to clean water, pleasant camping areas, relative proximity to an urban centre for shipping, and small town proximity for convenience services.

This list includes fires over 1000 hectares, excepting 23 CA which is almost 1000h. and has the desirable attribute of paved road access. Access to a fire plays a major role in determining cost per kg in getting morels back to Whitehorse for shipping to market. It is of some import that 18 CA and 14 CA have unusually opportune road access.

Together these burns total over 165,000 ha, which may be one of the largest viable harvesting areas in recent memory in Western N.America.. They cannot be viewed in isolation, but **must** be considered in relation to the 1995 burns in British Columbia. The BC fires are examined in 8.1

The actual logistics of a Yukon commercial mushroom harvest is a process of tremendous ongoing adaptation. In 1995, for example, there was insufficient rainfall to stimulate even moderate fruiting, according to general consensus of industry members. That of course was not always immediately obvious during June of 1995; occasionally someone would enter the camp with enough mushrooms to convince pickers that they had miscalculated their choice of area, altitude trajectories or even their aspect. This form of stress in a camp leads one to the following crucial question.

What is the optimal territory size for a picker to cruise? The answer to this question after experiencing what pickers were calling "the drought of '95" was indicative of mushroomer thinking: as much as is required until you can bring in about $200 a day while maintaining your physical ability to endure about three weeks of non-stop picking. If you cannot succeed in hitting that $200 level, due to lack of mushrooms, or if your fatigued body prevents you from picking mushrooms you know are on the ground, then the harvest venue has a problem.

Measuring **optimal cruising territory** cannot be accurately done only by area, but must include factors like terrain character, ground cover and fear of bear encounters; these in conjunction with the ability to carry weight (drinking water versus mushroom payload) and the all important variable, mushroom density, resulted in 1995 in the Yukon being a consistently poor year for the majority of harvesters. The main complaint in 1995 was lack of mushroom density, thus stressing all other factors listed above to some extent, until many pickers determined the optimal cruising territory was beyond the threshold of a strong walker (the strongest pickers walked up to 18km in very dry conditions in 1995).

Despite "the drought of 1995" the author estimates about 5000kg of dried morels left the Yukon. Only the faint of heart will be discouraged at attempting another harvest season in 1996 given the inviting nature of the Carmacks burns. Given Duchesne's 1993 observations of 2860 kg/ha of wet morel biomass in post burn conditions, times the available 165,000 ha burn area in Carmacks, the maximum 1996 biomass potential of the Yukon could be, in theory, about 471,900,000kg *wet.* Realistically however, natural ecosystem limitations on the morel preclude the likelihood of such a fruiting, referred to in the industry as a "wet dream". Accurate biomass predictions cannot be made due to insufficient baseline data in the Yukon.

Professional pickers will likely bypass less accessible burns in central/Northern BC for the ease of getting into these two burns. In fact it is of such

central concern that one BC picker chose to announce it to the world in early February; the following appeared on the internet's Mushroomers On-line:

> "I have been harvesting many types of fungi for resale...I have a vast knowledge of BC and the Yukon. I almost always have dried morels.... p.s. the Yukon looks good for morels this year"

To any picker this would indicate a large burn with paved road access and a river to facilitate camping. Indeed this is exactly what will be found on Route 2 for a distance of 35km; roughly in the centre of this stretch is Minto..

9. YUKON PRODUCTION SYSTEM

The Yukon production system is subject to a variety of trends in technology and economics. One important factor influencing the 1996 production system will be the increase in independent harvester use of the internet for computer marketing. Harvester dependency on the buyer (and hence the buying station) would be decreased as harvesters become more autonomous with this technology.

9.1 Site Analysis

To date site analysis has usually been done by examining fire maps during the winter and determining access quality by word of mouth with locals. With receding snow the burns are observed from roads and walked prior to fruiting. This observation allows for determination of campsites, buying stations and drying operations.

With warmer weather and spring rain/ humidity, test trajectories can be walked across a variety of aspects, altitudes and standing ground covers to spot early fruiting for an indication of areas of high population densities on the site. Southerly exposures tend to have higher concentrations according to most observations, but that has not prevented pickers from encountering dense patches on northerly exposures. Altitude tolerance ranges have apparently not been documented for morels. According to most observations they favour well drained slopes.

Aerial photography may be applicable to morel site analysis as the most efficient predictive strategy but has not been widely used. Cameras are either wing mounted or shots are taken through a glass mount set into the craft floor. In 1983 in BC initially float planes then later Piper Supercubs were used successfully to scout for matsutake. In 1984 helicopters were brought into use. Mushrooms could be spotted from hovering above holes in the canopy. Forest fire burns allow for better ground visibility but morel colouration is very close to the burnt ash of the forest floor. Low-hovering helicopters would likely be successful in spotting operations but at $800.00/hr would be an unviable risk for most buyers.

9.2 Harvest

Pickers walk the burn and hand cut each morel high on the stem. The most popular tool for this task is the Chinese made, six inch, serrated, black plastic-handled kitchen knife, commonly available for about 35 cents at stores such as K-mart. The mushroom is then placed in a carrying device; most pickers use plastic 5 gallon buckets which have been provided with numerous ventilation holes from either the tip of the harvesting knife or from shooting the bucket at a distance of some 10 metres with a 12 gauge shotgun.

Aggressive pickers will carry a stripped down aluminum back pack frame rigged to carry stacks of plastic 10 litre baskets in addition to two buckets. This allows the picker to deposit the pack in the centre of a morel patch and have greater mobility with the buckets. When the buckets are full he/she can empty them into the

baskets which can be left under a landmark while the buckets are refilled. In this way an aggressive harvester may cover up to 15km in a day, with upwards of 120 lbs of morels. An example of a carrying device may be seen on the Forest Fungi Homepage, a copy of which is included in Appendix A.

9.3 Sorting And Weighing

Arriving at the buying station, the morels are spread out on a wide table; over-mature, moldy, infested specimens or potential alternative species are removed. Morel stems are removed with a knife and the caps are then weighed. The picker is then paid in cash by the pound. In some instances, specimens which are mature may be infected with a maggot. The maggot species has not been identified. These specimens are removed.

9.4 Drying

Depending on the weather, morels can take up to two days to undergo the dehydration process. There are three options. On hot dry days morels can be set on drying racks(thin softwood frames with plasticized mesh stapled on) in the sun. Alternatively, wood stoves fired in drying shacks or large tents are effective. This process is often accelerated with an electric generator powered fan. Finally, in larger volume operations, propane fired burners are used in conjunction with fans. Diesel generators can be running 24 hours per day when high volumes are coming into the station. At 92% water the drying ratio is roughly 10:1. According to one operator, temperatures are maintained at 32-34 degrees C , and the morels can be dried in less than 24 hours. A photo of a drying shack is included in Appendix A.

9.5 Bulk Packaging

Dried morels are packed in green garbage bags and twist tied to prevent absorption of ambient atmospheric moisture. These are packed into cardboard boxes large enough to accept a full bag.

9.6 Transportation

From the buying, station ready-packed morels are driven to Whitehorse and sent by truck or plane usually to Vancouver. In Vancouver the Food Production and Inspection Branch of Agriculture and Agri-food Canada has the authority to administer the Fresh Fruit and Vegetable Regulations under the Canada Agricultural Products Act. Their responsibility is to ensure produce marketed as food in export (and interprovincial) trade is not adulterated or contaminated, and is free of living things injurious to human health. They may sample, test or simply inspect the mushrooms. In the same packaging they board the plane for their European destination.

9.7 Receiving And Inspecting

Every country has its own regulations concerning receiving and inspecting morels. In Switzerland, for example, where standards are among the highest in the world , all produce must land in Zurich to undergo the Swiss version of the Canadian Agriculture Products Act inspection. It is received by the Swiss buyer who inspects it, and verifies the weight done by Swiss authorities.

Mushrooms are sold by weight, and they tend to dehydrate under shipping conditions at high altitude. If shipments of 1000kg of dried product lose 1% from dehydration, that calculates to $1500.00 at $150.00/kg! Fresh morels are subject to even greater dehydration.

Other losses have also been recorded during inspections. One anonymous Canadian exporter related the following commentary, paraphrased hereafter: In France, it is well known that mushrooms may lose considerably more weight due to "dehydration in shipping"; by coincidence, the individuals responsible for official weighing are particularly fond of wild, high-quality mushrooms too. If the inspector "declares" the entire shipment unfit for human consumption they will be "destroyed" officially and the appropriate paperwork is made out while thousands of pounds of top quality black market mushrooms are trucked out of a depot to the toasts between the buyer and the inspector. Let the shipper beware!

9.8 Quality Control And Re-Sorting

Back in the laboratory the Swiss food engineers test the morels for bouquet, colour, and foreign matter trapped in the outer pores of the dried mushroom. As the Larousse Gastronomique advises, overly pointy ones are less desirable. The product is then streamlined for various branches of distribution.

9.9 Processing

Some morels are chipped for soup packaging. Knorr of Switzerland, the largest soup company in the world, engages the Germans to process morel chips. Specifications for morel chipping are extremely precise. Chips are no larger than 4 mm and no smaller than 3.5 mm and tend to be uniformly square. the packages inspected in Britain and Europe contain no more than six chips per package . There is no market for morel powder in Europe.

9.10 Retail Packaging

Morels are packaged by weight in designer plastic bags graduated from 25 to 100g in increments determined by the packager/marketer. These are sold in supermarkets across Europe. Delicatessen chains buy in bulk from importers and display them in fancy glass decanters allowing you to purchase the exact quantity requisite to satisfy the dimensions of your personal Morille a la creme.

10. LABOUR FORCE IN THE YUKON

10.1 General Characteristics/ Challenges

With the commercial harvest of morels being a new phenomenon in the Territory (1992 was the first recorded harvest), local individuals have not yet had time to develop industry expertise. The industry is highly itinerant with burn sites changing annually and buying stations moving location from South to North. Harvesters are generally self sustainable in their lifestyle, equipped to camp in any weather and break camp often.

The itinerant nature of the industry carries with it inherent advantages and disadvantages. Yukoners have not followed the harvest up from the US Pacific Northwest and are thus obliged to learn the industry "ropes" on the ground, competing with more experienced pickers. Just as BC workers have been learning from the Americans, so Yukoners must inevitably glean knowledge from BC workers. There are no training courses available in wild mushroom harvesting, and so industry knowledge must be hard won on the burns.

On the business marketing side of the industry, people are extremely secretive about their practices and their contacts. Buyers from BC or elsewhere want to buy from Yukon pickers but they fear competing with Yukon buyers who might drive up the price per/kg and limit their access to a share in the harvest. For this reason buyers have resisted training locals.

It must be emphasized that it is extremely difficult to determine accurate numbers for the size of the mushroom picking labour force. In BC, despite years of observation in the industry there is still no confirmed figures on numbers employed. This is amply illustrated by estimated numbers in BC, which range from 10,000 as suggested by an anonymous BC government source, to 20,000 as estimated by one key industry player. No employment figures exist for the Yukon. In 1995, based on the authors personal observations, there may have been anywhere from 300 to 500 people employed in harvesting. Given the large 1995 burns and increased interest in the Yukon, figures for 1996 could be in the range of 800 to 1000. Given that the Carmacks burns alone provide over 165,000 ha of possible harvest area, this would allow for an area of 165ha to 205ha per harvester.

10.2 Yukon First Nations

Yukon First Nations have an outstanding opportunity to meet the challenge of managing and developing an industry demanding a wide range of human resources. Not the least among the challenges involved will be management of resource ownership. One issue pertinent to the 1996 harvest will be informing morel harvesters of local concerns, including land selections.

HAN FIRST NATION, DAWSON

According to interviews with individuals in the Training Economic Development Office of Chief Isaac Inc/ Han Natural Food Products, in 1993 the Han had been involved in a venture with a morel buyer and the company invested in harvesting/drying equipment. In the first year (1993) the harvest was profitable, but in 1994 there was a loss and subsequently the individuals with the industry expertise left. In 1995 the company was not involved in any morel harvesting.

SELKIRK FIRST NATION

A number of the 1995 forest fires occurred in close proximity to the community of Pelly Crossing. It is anticipated that a large amount of industry interest in 1996 will be in harvesting, buying, drying and processing mushrooms in this area. The 1996 morel mushroom harvest represents a significant economic potential for the residents of the area, including people living in Pelly Crossing and those in the vicinity of the burns. Considerable interest has already been expressed by the community to actively participate in this year's harvest.

Burn 12CA has no paved road access and thus will not immediately be targeted by pickers. Access to 12CA by boat via the Pelly river or via Tatlmain Lake would appear to be the most favourable route.

LITTLE SALMON/CARMACKS FIRST NATION

The community of Carmacks is also in close proximity to some of the large areas burned in 1995. Therefore, it is expected that there will be significant opportunities for the residents of Carmacks to become involved in the morel mushroom industry during the 1996 harvesting season.

10.3 Profiles Of BC Migrant Workers

BC mushroom harvesters come from a variety of backgrounds, but increasingly there is a body of people who make their living exclusively from picking mushrooms. Such pickers would do morels in the Spring, move to chanterelles later in Summer and finish with matsutake in the Fall. Winter would be spent pursuing other activities. Some of the BC professional pickers are becoming extremely sophisticated. They are equipped with portable computers/modems and radio phones and they can be faxing European target markets daily gauging the morel quotations.

Many workers come from the tree planting industry and perceive morel harvesting as a welcome relief from these camps. Whereas the tree planter begins the day with a sizable weight and is constantly trying to shed that load, it is the opposite in morel harvesting. Pickers working as a duo often make caches on their route such that very little weight is carried except during the return sweep to the buying station.

One experienced individual interviewed claimed the total work force in the entire mushroom industry in BC/Yukon was 20,000; he felt that the BC Gov't

estimate of 10,000 (full and part-time) was far too low. These figures he estimated based on observation after years on the burns, socializing with mushroomers from whom he could glean and correlate information. The BC Government estimate was based on a similar process, only it must be remembered that there has been a tendency for some industry members to scale down both their earnings (for fear of revenue taxation) and the size of operations (to avoid attracting environmental attention)., An estimate in between these two sources, of 15,000 including weekend casual pickers, would not be unrealistic for the entire BC wild mushroom industry. It should be noted that all these figures are only rough estimates, and are highly weather, market and territory dependent .

10.4 American Migrant Workers

Professional American harvesters come with the morel harvest from as far south as California and increasing in number as each Pacific Northwest state comes in to fruiting . No statistics are available , however the 1992 figure of 10,400 pickers (Schlosser and Blatner, 1994) allows for a considerable number of cross border intrusions. Oregon and Washington license plates are not uncommon at the buying stations in BC and the Yukon. It is believed that this phenomenon partially evolved out of the itinerant American fruit harvesting tradition.

Based on anecdotal evidence, it is estimated that Americans comprise approximately 10% of the mushroom harvest work force in BC and the Yukon.. As experienced harvesters they can be expected to dry their own and likely transport the morels back to the USA in their trucks/vans for sale at better market prices - and for the stronger US Dollar. Many will also likely pass on to Alaska to casually harvest and to vacation.

The possible increase in American presence in the Yukon in 1996 will be due in part to the ease of accessing the Carmacks burns, and in part to the inaccessibility of the six largest BC burns. With each succeeding year, more and more Americans are supplementing their income with mushroom harvesting, and this dynamic obliges the more adventurous ones to seek less targeted burns further north .

10.5 Profiles Of Other Foreigners

One immediately noticeable quality about the mushroom camps is the variety of languages being spoken (at one camp in BC, eight were counted). Besides Americans, young French and German travelers often help finance their Canadian adventure by dabbling in under the table work such as tree planting or mushroom picking. Buyers are always willing to buy from anyone due to a chronic shortage of labour, due in turn to lack of awareness about the opportunity and the difficulty of the work. Foreigners learn of camp locations through word of mouth at hostels and cheaper hotels (where buyers often advertise for help) or at gas stations where buyers will advertise to catch the eye of waiting hitchhikers.

Based on anecdotal information, it is estimated that other foreigners comprise approximately 5% of the total mushroom harvest work force.

10.6 New Canadians

More and more New Canadians are observed in camps, willing to take the demanding opportunity where other Canadians will not. Of particular note have been the Central American Latino-Canadians who share vehicle expenses and arrive en masse following the burns north from their homes in Vancouver and Calgary. Often experienced at similar harvest work in the United Fruit Fields of their homelands, they work steadily and quietly, tending to outpick other workers and are always welcomed by the buyers. One such individual renowned for working longer and harder than anyone made $900.00 in one day at the Earn Lake burn in

10.7 Work Placements/Education Programs

Noting the lack of available labour from the buyers perspective, creative methods of attracting workers is being pursued. Advertising positions at Outdoor Education Schools/ Physical Education Programs is one such method. Such candidates are team minded and can work effectively with regards to covering a large geographical burn without falling into conflicts over "better grounds". Schools as far away as St. John's, Nfld. have been approached by buyers attempting to secure a number of cohesive, team-minded, self-contained crews for Yukon morel harvesting. These advances have been well received by schools eager to find work placements for their graduates. (Anonymous)

The potential of using the morel harvest as a vehicle for outdoor education training covering a variety of academic/technical fields should not be overlooked. In this respect there is more to harvest from Yukon burns than just the morels. There has been great interest from international bodies including the Japanese Nature Conservation College, responsible for training forest rangers for the National Parks/Conservation Areas of Japan.

11. ECONOMIC ISSUES

Economic issues in the Yukon morel industry are moulded by dynamics in the greater international mushroom market, specific trends within the Canadian economy, and the industry specific characteristics common to the Pacific Northwest United States, British Columbia, and the Yukon.

11.1 Product Pricing: International Supply And Demand

Although the demand for wild mushrooms has been steadily growing in the mass consumer market over the last five years, supply is the variable which remains uncontrolled. Price fluctuations in the international market can be dramatic, but generally allow for large profit margins for harvesters, buyers and exporters; these profit margins continue to be eyed by mushroom farmers, and everyone is keeping an eye on the domestication science. Despite offering steady supply (in theory anyway) domestic morel producers have not captured the international pallet.

In a 1994 article entitled "Mushrooming Morel Madness", cuisine author Pamela Parseghian writes in the American Nation's Restaurant News that:

> "..for many morel lovers the attraction to the cone-shaped morel with a honeycomb flesh is its early spring availability. However, its rich and earthy flavour certainly cements the relationship. About two years ago (1992) cultivated morels sprang up in the market place, but most agree that **their flavour is not equal to that of the wild variety."**

Early spring availability in France begins in late February when Turkish morels come on the market. With the Yukon harvest coming on line as late as June there is a period of four months during which all morel producing regions in the northern hemisphere gradually come into season. Thus, in theory, high Yukon prices are determined by the inability of other regions to produce due to small burn sizes, insufficient precipitation, cool spring temperatures, lack of adequate labour or any one of the myriad of as-yet-undetermined factors affecting morel fruiting. Considering other major morel producing countries are Turkey, Pakistan, India, Afghanistan, China and the East European countries, factors such as political instability (preventing harvesting, transportation or export) often limit supply. International currency fluctuations play a role as well, as do immediate environmental disasters and the gradually increasing global awareness that densely populated areas are dubious sources for contaminant-free wild products.

As each region from south to north comes into season, prices fall with the supply rush, or rise as the local harvest fails. In late March, 1996, Turkish morels were declining in availability as Pakistani and Indian supplies came on line and within days Zurich buyers had dropped the price from 26 Swiss Francs to 20 Swiss Francs per kilo of fresh morels (roughly 0.85 Sw F =1CN$). Fresh morel prices may range annually from $50.00/kg to $120.00/kg, whereas dry product ranges from,

$200.00/kg to $280.00/kg. Fresh frozen prices tend to mirror fresh prices until summer when fresh prices rise as fresh supply dwindles.

The difficulty in quoting prices in the morel world is the following. European buyers may quote a price at which they will buy Canadian product, but it in itself means little until the deal is struck because price quotes are feigned to acquire the most mushrooms at the lowest price. Any reason for lowering the price at the last minute may arise from "not enough quantity" to "country X now has them cheaper" or "another un-named supplier in Canada is providing them at lower prices to get his foot in the door". European buyers also sell to each other if one needs to fill a local distribution contract quickly, so the lines between buyer and seller become easily blurred.

11.2 Product Pricing : Yukon Camp Dynamics

The same dynamics exist between buyer and seller on the ground level in the Territory as exist in the corporate boardrooms of Europe. Concepts of "harvester loyalty to one buyer" fade quickly as price per pound rises at a rival buying station and harvesters flock there to sell their 100lb payload for $3.00/lb instead of $2.50/lb. Sometimes harvesters feel inclined to split their daily haul, increasing their income and establishing a new liaison with another buyer, while feigning "a bad day" with an established buyer. In this way harvesters try to pressure for higher prices and camp favours. Buyers in turn often provide preferential treatment to loyal harvesters who constantly produce heavy payloads.

Harvester loyalty also provides a security buffer for the camp. Without access to a bank, a successful picker is obliged to either carry or hide possibly tens of thousands of dollars in cash bills. Likewise the buyer may arrive for a two week period in camp with a strongbox containing well over $50,000. Untrustworthy characters are not welcomed by anyone. Cash thefts from Yukon buying stations are known to have happened. In one incident during the 1995 harvest, the robbery of $500 cash from a buying station was not enough for the buyer to create an ambiance of suspicion in camp by inviting the RCMP to investigate.

The system of favours in a camp is not to be underestimated. A buyer who is unprepared with cashflow for a heavy harvest surge may find himself handing out big I.O.U.s and uttering expensive promises. Suddenly a cash-on-the-barrel scenario has evolved into a bookkeeping nightmare complete with forged I.O.U.s by unscrupulous individuals. If the buyer cannot access a bank, in a few short days he could owe a "high-baller" a thousand dollars; this is a condition which not many harvesters like, but one which often arises, so buyers try to favour their loyal harvesters with daily payments. Other favours include providing transportation (to a limited fly-in camp, or to town for an evening of entertainment) or picking up supplies in town in addition to courtesy alcohol/tobacco/food. Sometimes buyers may offer an end-of-harvest cash bonus to lure as many harvesters as possible to their station. Competition can get fierce.

Price wars between buying stations are common, but usually level off once loyalties have been established. Prices per/lb have been known to jump up

$2.00/lb in price wars where buyers compete for scarce product to fill their contracts. Harvesters are not beyond inciting price wars by shifting en masse to another station. If harvesters attempt to withhold their daily payload in hopes of higher prices rumored for tomorrow, another dynamic can arise: wet versus dry product.

11.3 Wet Versus Dry Product

Weather providing, an individual has the option of sun-drying his morels and thus increasing the value per/lb tenfold. This situation can occur during a stretch of hot, dry days while the harvester is playing the market between stations. It may also arise out of necessity when adventurous harvesters penetrate a full days walk into a burn to access untouched grounds. It is risky for the individual for various reasons: morels left unattended at camp while the owner is out picking can attract thieves; if the relative humidity is too high the morels will not dry and begin to decompose or become insect infested.

Small groups of friends will sometimes opt to dry their own. This allows for one person to supervise drying during a slack day in camp in which they cook for the group. By running a small woodstove under a plastic lean-to they can dry communally and rotate slack days. Some Yukon buyers will refuse to purchase dry product in an attempt to discourage harvesters from playing the market - those equipped with capped pick-ups or vans can sell fresh wet product initially to gain cash flow and then begin to dry their product , allowing them the option of driving their morels to BC for sale after the Yukon harvest is over.

One harvester interviewed confirms average 1995 Yukon prices for wet at $4.00CN/lb and $50.00CN/lb for dry (harvester to buyer). At the ten to one drying ratio, one might wonder why the price for dry morels is higher than ten times the price for wet morels. The explanation is that there is a $10.00/lb incentive for labour, materials and risk involved in drying.

Some harvesters accuse the buyers of "profit gouging" them. One harvester also pointed to a phenomenon (common in the Yukon and other harvest venues far from the preceding burn) whereby a buyer invites an entire camp from BC to the Yukon promising favourable conditions and suggesting a higher price to compensate for the distance. After a week in the field, the price per pound begins to fall substantially due to "market factors". The harvesters are in a vulnerable position because they have already committed themselves financially to the return Yukon travel expenses and in order to profit at all they inevitably will stay. They are in no position to verify said "market factors" from the bush.

This inherent struggle for profit margin between buyers and harvesters is beginning to drive the latter to direct marketing - thus avoiding the buying stations on the burns entirely. Direct marketing can be done through internet facilities or by establishing contacts with European buyers directly. With success in this area harvesters inevitably begin marketing their friends' morels and so the line between harvester and buyer becomes blurred again.

11.4 Payment Structure

When discussing morel price per weight unit, the industry measures the product by the pound in the Yukon/BC camps but by the kilogram to European buyers.

(a) Picker to Buyer - this is done in cash at a price per/lb determined by the buyer when the picker arrives at the station. No records are kept.
1995 prices were roughly $4.00CN/lb wet and $40-60.00CN/lb dry.

(b) Buyer to Buyer - there were some individuals on the Yukon burns in 1995 who began buying stations to service groups of 8 to 10 pickers without vehicles who preferred to work an isolated area of the burn. These persons facilitate transportation of wet mushrooms with their van and are rewarded accordingly by the larger buyers to whom they sell. No records are kept.
1995 prices were roughly $5.00CN/lb wet.

(c) Buyer to Shipper - larger companies operating in the Yukon will have a shipper in Vancouver to meet boxes from Whitehorse at the airport or meet a truck/van delivering boxes. This "Shipper" of company X often contacts smaller buyers on the burns to buy dry, boxed morels. In this way company X can establish some profit margin control over their rivals on the burn who do not know the shipper is a link in the company X chain. Here there is payment by money order. 1995 prices were roughly $60.00-80.00CN/lb dry.

(d) Shipper to European Receiver- The shipper has an export license and arranges delivery to Europe by air-freight; payment is made by the European Buyer/Processor to the Canadian Shipper upon receipt of morels in Europe. Payment is made in various forms such as rapid international money orders.
1995 prices were roughly $90-175CN/lb dry.

(e) European Processor to Retailer - No data available

(f) European Retailer to consumer - packaged in small quantities and sold in fine foods shops and restaurants.
1995 prices were roughly $600-$675CN/kg dry ($272-$306CN/lb dry)

11.5 Contractor, Sub-contractor, Employee Relationships

According to Employment Canada, if a contractor is providing regular transportation for workers to the site, accommodation, workman's compensation benefits etc., then that worker is an employee. If the above services are not provided, then that worker is a sub-contractor. Whereas a contractor (in our context a mushroom buyer) has legal responsibilities and paperwork to provide for an employee, he has no responsibility for a sub-contractor or a mushroom harvester. In

the tree-planting industry it is common to hire employees, and then when the job is over the employees can collect Unemployment Insurance Benefits, providing the contractor has completed the paperwork.

In the fast paced world of mushroom harvesting, buyers simply appear on a burn site and erect a cardboard sign quoting dollars per pound. The next evening there could be forty pickers huddled around his sign, socializing. This site could evolve into a small village attracting services such as hot soup vendors, massage therapists and last for weeks. At any time the buyer can simply put his sign in his trunk and drive away without any warning or legal responsibility whatsoever. He is quite free to quote $4.00/lb in the morning as workers go off whistling into the burn and equally free to drop the price to $2.50/lb at 5pm just before tired, morel laden sub-contractors return to the station.

In this power dynamic a sub-contractor cannot be fired for littering or chopping down trees because he is not an employee to be fired. The buyer is not obliged to buy any ones mushrooms. As well the buyer has the option of making an example of the individual and in so doing, establishing camp norms or of allowing everyone to set their own standards.

Camps quickly take on a character determined largely by the buyer. It is for this reason that various US State licenses and permit regulations tend to focus on buyers. Environmental control can be inherently communicated by the standards set by the buyer.

11.6 Economic Benefits For The Yukon

All social sectors have the potential to gain economically from promoting the Yukon morel industry. At present, pickers, buyers, shippers, and industry suppliers of goods and services are benefiting. The governmental sector is clearly not yet acquiring financial benefit through taxation. One concern is that the government is allowing some individuals to freely profit from taking what is essentially a public resource.

Based on 1995 observations and personal interviews, it would not be unrealistic to estimate a total biomass payload for the Territory at 50,000kg wet (about 120,000lb). At 1995 prices of $4.00CN/lb wet, Yukon pickers would have pocketed $480,000.00CN. Those same morels sold at 1995 prices for dry at $50.00CN/lb (at 10:1 drying ratio there is only 12,000lbs) would have been worth $600,000.00CN. These are conservative estimates. Given the easy road access on the Carmacks burns, a prolific fruiting could easily quadruple that figure.

The morel industry has been affecting the Yukon economy in a positive way since the first commercial harvests in the early 1990s. In a regulated industry where data on harvesters, buyers and mushrooms is being gathered, demonstrating exact impact would be greatly facilitated. In the absence of accurate data, one can view the morel harvest against a relevant list of quantifiable measures such as those found in the Yukon Statistical Review, 1994 Annual Review. These comments are arranged below by statistical sector.

A. Employment

Morel industry workers are primarily employed in the Yukon during April, May and June as determined by the receding snow on the burns. Employment during the months of July, August and September in distributing and marketing morels through the summer tourism industry is also possible. Potential for designing and administering an annual in-season Yukon International Morel Festival could also add employment.

There is vast opportunity to expand Yukon involvement into product processing and marketing. This remains a niche that has been largely unexplored and could easily lead to further employment.

Given that BC government and private industry estimates run between 10,000 and 20,000 full and part-time workers in Western Canada, it would not be unrealistic to predict 1,000 workers active on the Yukon burns in 1996.

Daily incomes of $300.00Cn would not be unusual for committed workers, although most debutantes enter the market at around $100.00CN and improve gradually as they adapt physically and mentally to harvesting. Because buyers are willing to acquire as much product as possible, the industry is capable of absorbing as many unemployed as morel biomass can support. This could lead to significant employment opportunities for Yukon people.

B. Consumer Prices

Industry workers spending their earnings on supplies to survive independently on the burns would affect the Spatial Price Indices. It is also possible that local retail prices of Petroleum products would respond to the presence of morel camps in the area. Diesel generators to power fan blowers can be run 24 hours a day.

C. Rental Units

Local rent rates would respond to those morel workers who prefer not to camp in the rough, and buyers who choose to set up a more formal office for a large operation. This could affect vacancy rates in communities during harvest season.

D. Resources

With regard to Petroleum Products Sales, it will be noted that motor Gasoline, Diesel fuel, Aviation Gasoline and Kerosene are all voraciously consumed in the industry.

E. Trade

Given proximity to a town, workers will often opt for dining out, increasing restaurant receipts. Industry workers are renowned for their steady consumption of fluids, due in part to the dryness of mouth associated with floating

ash in the working environment. This has been known to manifest itself in alcoholic consumption at the end of the day.

F. Transportation

Morel camps are itinerant. Itinerant workers come mainly from the Pacific Northwest States and BC, but also inevitably from Alaska; not all workers have personal vehicles, thus they rely on public transport.

Morel burns not accessible by road have been exploited using aircraft to move workers, equipment and the mushrooms; for example, float planes from Faro were used to access Earn Lake in 1995.

12. ENVIRONMENTAL ISSUES

Generally the concern over environmental impact of commercial morel extraction in the Yukon centres on the perpetual sustainability of forest eco-systems. It would seem reasonable then that the overriding concern when developing ecosystem management strategies to deal with this particular mushroom harvest should be the accumulative impacts: not only the accumulative impacts of the morel harvest alone, but also the accumulative impact of other botanical species harvesting which may happen synchronically and/or on the same land. It is important to realize that morel harvesting is the thin end of a wedge driving open the Yukon forests to increasing exploitation of many underutilized botanical species. To not acknowledge this from the beginning is to ignore the rapidly evolving industry trends to the south which are in turn driven by complex global economies.

Specifically, industry players are confronted with the task of balancing the natural resiliency of a burn site against the intrusive action of initiating a commercial task operation. Given the astounding lack of adequate baseline data on morel ecology, all players are only guessing at burn site ecosystem tolerance.

As the forest begins its first spring of post-burn rejuvenation, we see morels fruiting in association with certain plants/trees and playing a vital role in soil nutrient cycling. But not much is known about the impact of harvesting on ecosystem degradation. Surely extracting biomass can have a detrimental effect on the former users of that biomass. To suggest that morel biomass was going to waste prior to commercial picking is a fatuous argument. Morels either provided nutrition to wildlife or they were deliquescing and their constituents were used by some organic matter. Many harvesters have suggested that keen-nosed bears feed on the odiferous morel, in the same way that a pig will snout for truffles. Identification of functions of harvested species is thus of crucial import.

One concern is the harvesting impact on morel productivity and gene pool. A survey of the literature and interviews with key industry members has demonstrated that fundamentally the Yukon morels have not yet been properly identified according to a mutually respected taxonomy. Therefore the impacts of harvesting on the gene pool and productivity cannot be accurately monitored. These issues need to be addressed before the morel population is threatened with extinction. As more species are identified for extraction, the balancing of harvesting levels with biodiversity objectives must be considered.(DeGeus, BFP in BC Overview, 1995). Clearly identifying ecological research requirements is obviously one of the immediate challenges which should be addressed to assure long-term sustainability.

Other issues include increased human activity in the forest eco-system; inappropriate harvesting techniques (such as ripping mushrooms out by hand), soil compaction and degradation, and fire risk potential. Environmental impact should also be examined in the light of natural cycles occurring at harvest time. Most wildlife species have periods in the life cycle or seasonal life cycles when they are particularly susceptible to what might be perceived as small impacts. One suggestion is the limiting or prohibiting of harvest activities in sensitive areas where the preservation

of biodiversity, the avoidance of unstable soil conditions, the protection of riparian areas, denning areas and calving/breeding areas are important.

In order to avoid environmental impact in sensitive areas, harvesters need to be informed where not to work as much as where to work. In the Yukon, as elsewhere in Canada, mushroom picking is not permitted, for example, in National Parks, Defense Lands, Ecological Reserves or Recreation Areas. Picking requires permission (one should assume written) on First Nations Reserves, Leased Crown Land and of course, Private Lands. At present picking is permitted on Territorial Forest Lands.

12.1 Harvest Venues : 1995 Quality Damage Estimates.

There were eight major burns in the Yukon in 1995 where numerous buying stations were established. Three burn sites were situated near Ross River, one near Little Salmon, one on Earn Lake, one northwest of Carmacks and two in proximity to Dawson. 1995 was exceedingly dry for morels - dry enough that most of the Carmacks fires were in flame during peak harvest. This led to pickers breaking and moving camp regularly as rumours about large morel patches bounced from camp to camp.

Also present in 1995 were BC/Alberta gold prospectors who used the Yukon morel camps as a base. Morel picking defrayed or covered their travelling/living expenses, allowing them to investigate various claims. Pans and mercury were carried on all outings and after picking they disappeared from camp to pursue their activities. The author accompanied one such outing which had targeted a closed mine area up the Ketza Valley. On our return we encountered the mine security warden who claimed, (perceiving us as prospectors) that mushroom pickers had vandalized a building or done some damage at the mine, and were considered to be a confirmed nuisance. He was most suspicious of the Ketza morel camp and expressed surprising hostility.

The most significant impacts noted by the author in 1995 were as follows:

SOIL - With individual campsites being quickly made and quickly abandoned, a proliferation of fireplaces was noticeable.

Several vehicles underwent oil changes in the woods as pickers took advantage of low morel populations to catch up on personal engine maintenance duties ignored during the trek north from Oregon.

In an attempt to stay busy, some pickers waiting for morel fruiting hauled river stones to build a central fireplace. The stones were taken from the closest place on the bank which was soon denuded. Repeated trips to the riverside by about 50 people soon led to serious erosion.

PLANTS - Repeated random tenting quickly flattened the campsites, leaving visible rectangular imprints between fireplaces. Some individuals chose to attend buying station firesides while others dragged down wood for personal fires. 1995 was dry enough that anything on the ground would burn.

In one desperate episode geared at locating morels, the buyer provided a four-wheeled ATV and chain saws in order to blaze a trail deeper into the Ketza burn. Carrying four workers in a trailer the ATV left deep prints in low lying areas covered by mosses. A stream crossing was done at random without attention to siltation and no thought to using the chainsaws for building a low technology bridge.

FISH, BIRDS AND MAMMALS - The diesel generators running constantly to power electric fans cleared camps of birds. Dogs were staked near kitchen tents to dissuade bears from investigating. Multiple fishing lines were set up by groups and checked several times per day. In BC camps there has been repeated incidences of bear encounters and whispers of bear fatalities. These would not be reported due to fear of investigation and possible penalty for unregistered firearms, uninsured vehicle or anything else that a picker might prefer to remain uninvestigated for.

SANITATION - Buying Stations were usually set closer than the regulation 30 metre distance to water bodies, in order to reduce effort in carrying water taken for washing. Grey-water dumping was done at two paces from the kitchen area. the author has never seen a toilet in any mushroom buying station in the Yukon. Several women discarded or buried sanitary napkins while out harvesting within proximity to the camps. This was presumed to be the cause of repeated bear incursions before the dogs were recruited and the women instructed to burn their napkins in the garbage fire.

GARBAGE - In all 1995 Yukon camps the author visited the garbage was initially burnt. Cans and bottles were removed the next morning, bagged in green garbage bags and either buried or taken to town depending on how soon someone was going in. Garbage was never allowed to linger for fear of attracting bears. Driving the Canol Road between Ross River and the North Lake Burn site, the author noticed roadside litter at frequently alarming intervals. It was unclear whether morel harvesters were responsible.

It should be noted that litter has become a conservation issue in areas of intensive matsutake harvest in BC. In the Nass Valley and Cranberry Junction areas, for example, food wrappers, drink cans and bottles, camping refuse and toilet paper are evident in alarming quantity in the harvest areas.

12.2 Potential issues for the 1996 Yukon harvest

The obvious morel hunting strategy on the 35km of paved road through Minto bordered by two burns each of over 50,000 ha will be to enter at random points and walk test trajectories. Next, pickers will likely seek side roads, old mine roads or any abandoned track which will allow them drive-in access. Soon pickers with vehicles will be looking for campsites - close to the Yukon river, out of sight of Route 2 if possible, and convenient to drive to a buying station.

Buying stations will likely emerge initially in Minto near the West side of Route 2 in proximity to the government/ private camp grounds marked on the Official Road Map. Another strong possibility is the area around Pelly Crossing where the Pelly River crosses Rte. 2. These sites share numerous qualities. Both have paved road access to burns, a river, campsites and landing strips (for those considering predictive viewing). Neither sites have float plane aerodromes; the closest aerodrome, at Faro, will be examined for accessing CA 12 at Tatlmain Lake but will probably be declined for the options outlined below. Although Minto has greater proximity to CA 14 and CA 18, Pelly Crossing has a distinct advantage as a buying station.

The Pelly River could be used to access CA 12; so could Tatlmain River - both flow through Pelly Crossing. The advantage lies in marine fuel consumption. If a picker or buyer motors upstream on the Pelly River to exploit CA 12, on the return the boatload of heavy morels will be travelling with the current, consuming less fuel.

Although Minto could be a potential base for accessing CA 18 towards Fort Selkirk by descending the Yukon River, the scenario would be much compromised by a requisite return journey upstream laden with the payload. Fuel expenses could be prohibitive, but there is yet a greater consideration.

Both Minto and Pelly are surrounded by First Nations land selections and interests. There may be complete ignorance on the part of some harvesters as to where First Nations interests are located. Protecting those lands from environmental degradation on such a long strip of highway accessing over 165,000 ha of fruiting burn site will be a logistic challenge.

As has been already noted (section 1.2), intentional setting of forest fires to stimulate morel growth dates to medieval times in Europe. In March 1992 during the Wild Mushroom Discussion Session held at the Pacific Forestry Centre in Victoria, BC, Scott Redhead (Ag.Canada Centre for Land and Biological Research) pointed out that in Oregon there has been concern about people deliberately setting forest fires to promote morel production. Prescribed burning of land in Ontario has been documented (by Duchesne) as resulting in massive morel fruiting. It is a concern that zealous mushroom harvesters in the Yukon do not take the initiative of intentional burning for increasing their potential future profits.

If morel pickers are made to feel like trespassers (by over-posting of signs prohibiting morel picking) a game of hide and seek could develop. Many BC pickers are adept at surreptitious harvesting in Oregon and Washington either without licenses or on lands where harvesting is prohibited. Many American pickers are accustomed to treading softly in suspicion of local Canadian authorities.

With paved road access and huge burn sites, authorities should anticipate increased numbers of pickers. With increased human presence in these delicate burn ecosystems one can expect increased soil damage from: potential diesel fuel spills during generator refilling, proliferation of random campfire sites and indiscriminate road making in an effort to drive closer to morel concentrations. One can expect increased plant damage from more campsite clearings, copious firewood collection and aggressive trail-blazing. One can expect increased negative impact on fish, bird and other wildlife habitat due to encroaching on their territory and marked noise pollution from generators, fans and radios. One can also expect increased

unauthorized garbage disposal and omnipresent littering as new workers get absorbed into an industry where no training course or permit is required and where the motto of "garbage packed in, garbage packed out" is not yet common currency.

13. REGULATORY OVERVIEW

Washington State regulated their wild mushroom harvest industry in 1989, requiring the annual licensing of buyers and processors of all wild mushrooms. In January 1994, the BC Pine Mushroom Task Force decided that comprehensive regulation of the industry was not immediately possible due to the lack of business and scientific data for the industry.

Consequently the task force recommended the licensing of pine mushroom buyers only. This will assist the Gov't. in collecting information requisite to address the problems currently affecting the commercial harvest.

Regulating wild mushroom harvesting is a gradual process, best done with public consultation and representatives from all industry areas. Regulations have been coming into effect in various states in the US to address legitimate concerns from various sectors of societies. BC has gone through Task Force Studies and public consultations and may be very close to implementing more comprehensive regulations for a number of special forest species.

13.1 The American Experience

Below is presented an overview of the 1990 Washington State Wild Mushroom Harvesting Act. As a leading US producer and as a Western Pacific region state, its experience would appear to be most appropriate to the Yukon. This Act is administered by the State Dept. for Agriculture.

Definitions

Mushroom Buyers are persons who buy wild mushrooms from harvesters for eventual resale, often at roadside or other buying stations.

Mushroom Dealers are defined as persons other than mushroom buyers who purchase and handle wild mushrooms in any manner whatsoever for resale, either wholesale or retail. Under this definition, restaurants purchasing wild mushrooms from harvesters directly could qualify for the lower priced buyer license.

Mushroom Harvesters are persons who pick wild mushrooms for sale or who pick wild mushrooms as an employee of a mushroom buyer or dealer.

Basic Requirements of the Act

The law requires an annual license of persons who buy and process wild mushrooms for market. Buyer/Dealer licenses are $75 and $375 per year respectively; harvesters are exempt.

Mushroom buyers must send a prescribed form to the Dept. of Agriculture each month that includes: a)site of purchase, b) amount by weight of each

species obtained, c) approximate location of harvest site, d) date of purchase, e) price paid to harvester and f) name, address and license number of dealer to whom mushrooms are sold. Other information may also be required. Dealers must complete a similar form when buying wild mushrooms from sources other than licensed buyers.
By December 31, dealers shall send to the Dept. of Agriculture a prescribed form that includes for each variety of mushroom: a) quantity by weight sold within Washington, within the US, and to individual foreign countries; b) other information, as might be required.

A major difficulty in selling wild mushroom "stumpage" is how to enforce compliance without undue cost. Low cost methods that seem to be evolving are "over the counter" permits that pay the landowner either for a specified amount of mushrooms or are good for a certain period of time. For example, the Umatilla and Wallowa-Whitman National Forests in the Blue Mountains of Southeast Washington and Northeast Oregon sell harvesting permits for $50. Personal use permits are free with a picking limit of 5 gallons. Mushroom buyers using federal land as a purchasing station are required to have a $100 annual permit and a free industrial camping permit. While on federal land, these buyers may purchase mushrooms only from pickers with valid federal harvesting permits. (from Russell, K. *Special Forestry Products Workshop, 1990*).

13.2 The Canadian Experience

In Canada, the BC Govt. is clearly the most advanced in the wild mushroom regulation process. Of particular note is that the majority of respondents to the Public Review process "felt that the government should be involved in the wild mushroom industry to ensure the resource is managed for the long term and most believed that industry participants should contribute to government revenues." (deGeus, July 1995)

Certain specific recommendations evolved out of the BC public review process appropriate to the Yukon morel industry. These include:

- Minimize the level and extent of administration and increase the emphasis on self regulation.
- Evaluate whether government can afford a new administration framework and field staff to ensure compliance with regulations and standards.
- Establish an administration structure similar to that used to regulate hunting and fishing.
- Recover the cost of administration from revenues generated from licences and permits.
- Hire someone to collect data on harvest

The constant experience of governments across the US and BC is that regulation is difficult/impossible to design until the harvesting statistics are complete. To date no concrete statistics exist for any area of Yukon morel harvest.

It should be noted that despite the lack of specific legislation pertaining to the harvesting of wild mushrooms, there are already several existing acts and regulations that do apply to this industry.

The following legislation has been identified as pertaining to the wild mushroom industry in BC.

1 Federal Gov't.:

Canada Agricultural Products Act
Customs and Excise Act
Fisheries Act
Food and Drugs Act
Migratory Birds Convention Act
Pest Control Act
Plant Protection Act
Transportation of Dangerous Goods Act
Wildlife Act

2 Provincial Gov't:

Agricultural Land Commission Act
Agriculture Protection Act
Plant Protection Act
Soil Conservation Act
Environmental Management Act
Pesticide Control Act
Waste Management Act
Agricultural Waste Control Act
Open Burning Smoke Control Regulation and
Code of Practice
Ozone-depleting Substances Regulation
Special Waste Regulation
Spill Reporting Regulation
Water Act
Wildlife Act
Health Act
Fire Services Act
Municipal Act
Workers Compensation
Act Highways Act
Motor Vehicle Act

14. CONCLUSIONS AND RECOMMENDATIONS

It is important to recognize that the Yukon Territory is in a privileged position globally in terms of forest reserves, and hence mycoflora reserves. Due to increasing demand for more quantity and better quality wild mushrooms, the Territory will continue to be a venue for future harvests. *Morchella* varieties indigenous to the Yukon could be the thin edge of a wedge leading to increased extraction of a variety of botanical forest product resources.

The unique 1996 situation of numerous large, road accessible forest fire burns in the Yukon in the same year as no such burns in BC means that the Yukon could experience an unusually high level of harvest activity. Such activity in a concentrated area in the Carmacks Fire Region provides the Government with a rare opportunity to document harvest data and monitor industry features. It also presents a variety of challenges in terms of initiating new developments in an industry which remains largely unregulated, educating the local population such that sustainable benefits can be enjoyed by Yukoners, and ensuring the harvest process does not detract from environmental integrity.

14.1 Issues Requiring Further Study

1. Every aspect of Yukon morel biology and ecology require further study. More specifically, a focus on the following are important:

a) temperature and precipitation statistics collected during May and June on the south slopes of 1994,95 and 96 burn sites.

b) test sites established on south slopes of 1994,95 and 96 burn sites to determine: **1)** biomass data for the rate of decline in subsequent annual morel fruitings on the same burn after the first spring, and **2)** total species biomass capacity for the Territory.

c) for prediction strategy development --determine morels' preferred Yukon conifer species for ectomycorrhizal association; also any preference for undergrowth plant association.

d) given that *Morchella* establishes well on disturbed soils, buying and drying station sites on 1994 and 1995 burn sites should be examined as controlled test sites for morel development. The soil in these site floors will have been impregnated with a concentration of morel spores.

e) while at these venues, observations of enduring environmental impact should be assessed.

f) test sites should be established in the Yukon where any clearcutting has occurred in the last two years, or is occurring during 1996. Control sites

on these cut areas should be seeded with morel spore taken from 1996 harvest locations.

2. Underutilized applications of Yukon morel should be investigated including:

a) the use of *Morchella* mycelium for producing an odiferous concentration appropriate for alternative processed mushroom products.

b) pharmaceutical applications both in standard scientific clinical use and homeopathy/natural medicine.

c) the use of morels in dyeing fabrics, with and without a mordant, as some wild mushrooms are now being used for cottage industry dyeing of wool, silk, cotton, etc.

14.2 Recommendations

If the Yukon morel industry is not developed appropriately it has the potential of becoming an environmental problem resulting in a wide range of conflicts. Accordingly, if appropriately developed it will most certainly contribute considerable assets to local Yukon economies and have negligible environmental impact.

The long-term challenge on the Yukon is to educate local business entrepreneurs in the dynamics of the international morel market from all aspects. Some individuals will prefer to pick, while others prefer to buying/drying operations.

Developing a processing industry in the Yukon is a realistic challenge. It will likely require a joint marketing venture to stimulate the Canadian domestic market, so a wide variety of skilled individuals will be required. Certainly if Yukoners simply pick mushrooms and sell them at buying station prices to others who export them to Europe or process them in BC before marketing the refined product, they will never realize their full economic potential.

1. With regard to Regulatory framework, it is recommended that the Government inform Yukoners, in particular the Carmacks region population, of the ensuing 1996 morel harvest. The following process is suggested:

a) a pre-harvest information seminar to inform people about economic opportunities and environmental impacts, and to collect suggestions for input into the development of an appropriate policy on morel resources,

b)monitoring from the Yukon the industry regulation developments in BC and American Pacific NW States, especially Oregon and Washington, as they adapt to new environmental data published on

mycoflora ecosystems. This will allow the Yukon to benefit from harvest experiences in other regions.

c) a post harvest public review process of the 1996 experience in order to adapt an appropriate policy for 1997.

2. Government should **research and publish an information brochure** to inform and educate industry members and potential members. It should address:

a) Personal safety in the forest (including recommending harvesters carry dusk masks to prevent accumulative ash inhalation)

b) Locations where picking morels in the Yukon is permitted.

c) Litter, Campsites,

d) Forest Ecosystem Protection

e) Background on Yukon morel

f) Appropriate harvesting methods

g) Wildlife encounters

h) Contamination by false morel look-alike species

3. Government should put in place a procedure (in lieu of full scale regulation) for **ensuring collection of harvest data from burn sites. Morel mushroom buyers/dealers should be required to follow an interim permit system** for the 1996 harvest, modeled after the Washington State Wild Mushroom Harvesting Act (see **12.** above). However, given most buyers may not be Yukon residents, buyers should be obliged to submit the prescribed Harvest Data Form to the Department (responsible for administering the permits) at weekly intervals. See "Basic Requirements of the Act" for harvest data. In addition to this, particular data important to the Government can also be attained through the same form (e.g. bear encounters). A procedure ensuring collection of accurate harvest data will facilitate the future development of a responsible morel resource policy. Requiring buyers/dealers to purchase a permit will help provide the financial resources requisite to facilitate the collection of harvest data.

4. Government should investigate the ability to **authorize potential sites for locating buying stations** on Rte 2 between Pelly Crossing and Carmacks in order to avoid problems pertaining to environmental impact, traffic issues, land access, etc.

If such procedures are adopted the opening of a buying station in an unauthorized area would be subject to immediate closure.

5. Government **should inform the RCMP of the ensuing morel harvest,** and discuss the potential for conflict in the four large Carmacks burns. A useful contact for Whitehorse RCMP would be Mr. Rick Vincent, RCMP, 2881 Nanaimo Street, Victoria, BC V8T 4Z8, who has attended public meetings during the Wild Mushroom Harvesting review process in BC. He is versed in the nature of potential conflicts in this industry.

RCMP should also be informed of the need to **liaise with Canadian Immigration officials** in regard to investigating American pickers without a valid work visa. This has been an intense issue in BC as locals have observed valuable resources and revenue disappear upon the arrival of a self-contained American camp.

6. Government should **initiate a system of "Demarcation of Origin" for the Yukon morel**, modeled after the European fine wine/cheese industry. This would increase the profile of the Yukon morel as a world-class delicacy, supporting long term higher prices for the Yukon economy.

7. Government should work with Agri-Food Canada to **establish a system capable of monitoring the details of morel export quantities**. This will provide the Government a more accurate profile of global market destination and establish the Territory in foreign commercial databanks at the Commercial Division of Canadian Embassies, thus elevating the international commercial presence of the Territory.

8. Government should **establish a special forest products resource centre**, including a botanical forest products library, open to the public; this might take the form of a desk at a public library, updated with material as the Yukon specific data begins to accumulate. This will provide for easy public access to information resources requisite for the development of a creative Yukon based industry.

9. Government should **develop procedures to ensure harvested morels are not contaminated with false morel look-alike species**, including *Gyromitra esculenta, Verpa bohemica* and other unidentified toxic Yukon mushroom varieties. Such measures could include addressing the contamination issue in the information brochure (see 2. above), providing advanced identification training to buyers, and subjecting harvested batches to inspection by a qualified government authorized inspector.

14.3 Key Development Issues

a) Opportunities

Independent computerized marketing of morels on the internet offers exceptional opportunity for small scale local entrepreneurs. See Appendix A.

An International Wild Morel Festival and Chef's Competition would capitalize on existing environmentally minded tourism clientele and also attract a refined class of cuisine artists from around the world; such a venture carries great promise of spin-off opportunities.

Local business capable of providing support services to morel pickers and buyers have a large window of opportunity: from designing solar dryers to adapting float planes to ferry morel payloads, the industry provides a range of unexplored possibilities.

Television documentary industry individuals from Belgium to Tokyo have expressed interest in doing a program on the wild morel harvest. Perceived as a cutting edge industry in an exotic wilderness setting, the Yukon morel harvest may in itself become a vehicle of opportunity.

Beyond all others, an immediate opportunity with vast potential for growth is the processing of dried morels into alternative products. Dried wild morel soup mixes for hiking, climbing or canoeing could be made, packaged and marketed from the Territory. (Organic morel snack chips could replace the potato chip!).

b) Constraints

The major constraint on developing the Yukon morel is lack of knowledge about the international industry. This will change only if proactive action is taken to educate the Yukon population. For the 1996 season, Government support for a short course in Business Development in the International Morel Industry, offered through Yukon College would be a realistic and prudent move.

Another major consraint is the lack of understanding about morel biology and ecology. The latter will unfold as mycoflora studies emerge and as years of accurate

Distance to European market is the second most important constraint, but not a serious one. Dry morels do not have to be moved quickly to market and price/kg is high enough that transport cost per unit is not a threat. For wet morels however, Yukon exporters will be well advised to know their product and air freight details; Canadian air freight remains more than sufficient to manage wet export.

One creative solution to the distance constraint is to work on developing the Canadian domestic market, and of course the morel gift market for well heeled foreign visitors who appreciate the best delicacy mushroom in the world.

PERSONAL COMMUNICATIONS

Many thanks to all those who participated in interviews in person, by e-mail, fax, telephone and by post. I would like to acknowledge the kind support of various individuals, especially those industry members who participated on condition of anonymity; also to those listed below, (in random order) and to those whom I have inadvertently not included.

Lorraine O' Brian, Little Salmon/Carmacks First Nation, YT
Dr. Luc Duchesne, Canadian Forest Service, Ont.
Brenda Callan, Pacific Forestry Centre, BC
John Sullivan, Canadian Embassy, Dublin
Kathie Hodge, Myco-web, Cornell University
Dr. J. Bigham, Vancouver Health Dept.
Inspector George Eng, Vancouver Health Dept.
Margaret Barron, Memorial University of Nfld.
Alex Morrison, Executive Officer, Selkirk First Nation, YT
Folks at Economic Botany, Kew Gardens RBG, London
Grant Ferguson, VP, Great Canadian Mushroom Co. Ltd., BC
Bruce Chambers, Director of Renewable Resources, YT
Hiroshi Matsunaga, Canadian Embassy, Tokyo
Rob Mackintosh, Pembina Institute for Appropriate Development, AL
Brian O'Riley, Horticulturist, University of Waterloo
Sharon Labchuck, ECOPEI, Millvale, PEI
Dr. Tom Volk, University of Wisconsin, Madison
Michael Wood, Myco-Web, California
Risi-Nahrungsmittel, Steinhausen, Switzerland
Bruce Luznar, General Manager Chief Isaac Inc., Dawson, YT
Calliarl Import and Export Ltd, Vancouver
Nancy Smith-Weber, Oregon
Sabarot-Wassner, S.A., Brives, France
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Lorlei Norvell, Pacific NW Mycology Services, Oregon
C.W.Nicol, Vice Principal, Nature Conservation College, Nagano
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Tony Hill, Renewable Resources, YTG

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APPENDIX A

An example of computerized

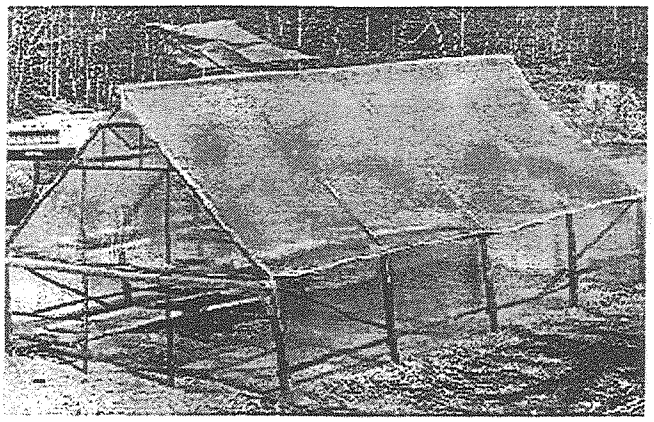
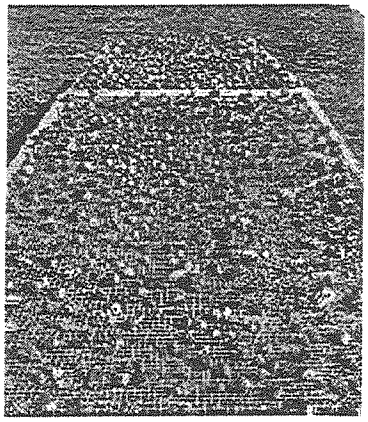
Internet marketing of Yukon/BC morels.

These homepages are updated

regularly, and accessible

around the globe

to Net users.

Commercial Mushroom Picking

by Randy Marchand

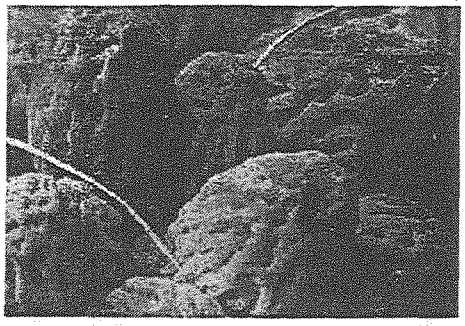
Picking mushrooms could be one of your most consequential endeavors, and one of your favorite pastimes. Do you like the quiet of the forest, the beauty of nature, or the thought that you could be of the few who can harvest from nature without destroying the environment. Mushrooms like the Matsutake, can consume your fall months like passions of your first love. As I heard one commercial picker say, it's like being on a constant Easter egg hunt and being paid very well for it.

Whatever fungi you choose to pursue the hunt will hold you in its' spell. A sudden rain shower, at the beach, will have you blurting a loud "yes", much too the shock of those who prefer hot sunny weather. The more time you spend searching for mushrooms the greater the urge to be out finding the mother load. If you're getting the idea that this hobby borders on the cult you are not alone. I've known people to ignore the threat of raging grizzly bears, torrential rainfalls, rock-slides and freezing cold mornings just too get a few more shrooms. After all is said and done the harvesters will all say it's the greatest. They can not wait for next years' season to get here a few scant weeks after this season is over with. Put more than one mushroom picker in a room and the topic of conversation will soon be on mushrooms. If this is all seems a little scary rest easy, because it's the greatest. See you in the patch.

Most commonly Marketed Wild Mushrooms:

Pine Mushroom ..... Tricholoma Magnivalarie
Morel Mushroom ..... Morchella (all varieties)
Chanterelles Mushrooms ..... Chanterellus Cibarius
Boletus Mushroom ..... Bolletus
Lobster Mushroom ..... Hypomuces Lactifluorum
Hedgehog Mushroom ..... Dentinum Repandum
Oyster Mushroom ..... Pleurotus Osteatus
Chicken Mushroom ..... Laetiporus Sulphrueus

Picking mushrooms can be fun and profitable. First, you must be prepared to spend time in the forest, so you will need maps, a compass and some simple survival gear. Second, find out before hand where you can sell your 'shrooms', or how you can preserve them. Third, you must harvest your mushrooms in an environmentally sensitive manner. If you harvest your patch in a environmentally sensitive manner, your garden will reward you. The less evidence of picking that you leave, the less likelihood of other pickers finding your patch. The easier you are on the mushrooms' environment, the more likely the organism will survive. The gentler you are on your garden, the more mushrooms it will reward you with.



Morel Mushrooms

From the Natural Environment of Western Canada

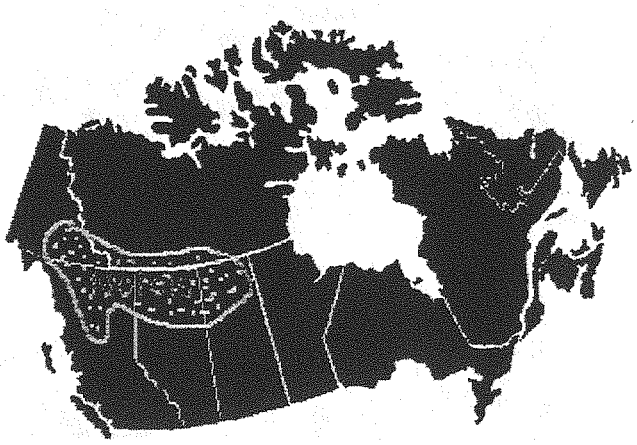
Morels grow throughout western Canada, and are especially plentiful following forest fires. Morels pop up in the spring, the year after a fire, following the retreat of melting snow (as late as mid-June in the north). Pickers collect the morels and we dry the mushrooms on site in temporary shelters constructed in the forest. The morels are stored in sterile, airtight containers, for distribution to wholesalers, restraunts and private cuisine. We have limited quantities remaining from the 1995 season.

You can order some dried morels, to be shipped by air mail, from this site, or you can simply visit and learn a bit about how its done, and read some stories written by pickers. If you have some stories you wish to add, mail them as a plain text attachment to the link below. Thanks for visiting!!!

Intro | Pickers | Drying | Stories | Order

For more information,
contact Forest Fungi in beautiful Victoria, Canada

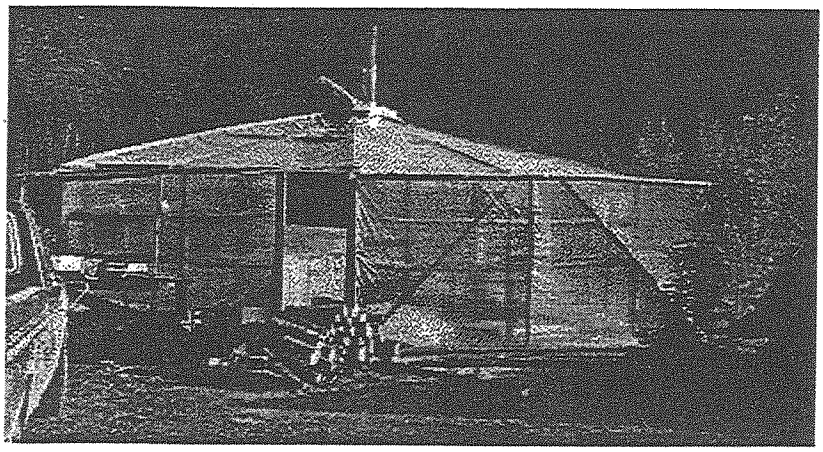
Map of Canada



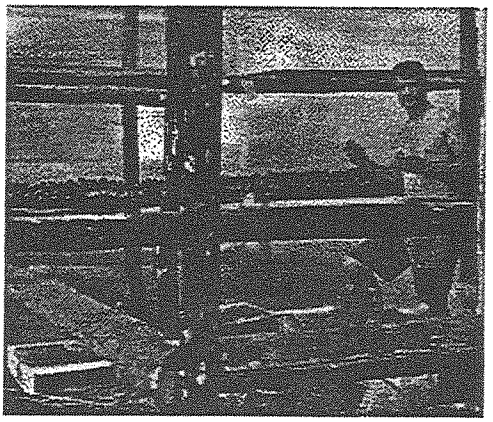
Morels grow across a wide area in northern Canada. Four-wheel drive trucks, boats, airplanes and hovercraft are used to carry pickers into the patch.

For more information,
contact Forest Fungi in beautiful Victoria, Canada

Morel Mushroom Dryer, 1995

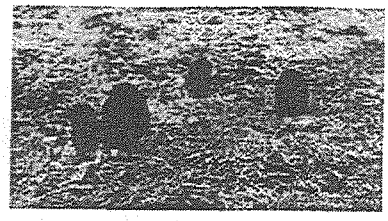


Inside the Dryer



The dryer is a temporary structure erected in a convenient location near the mushroom picking area. This one measured approximately 75 square metres, with a hexagonal floor plan. Drying racks are on two levels around the exterior, and two airtight wood-burning stoves are in the center. A series of large electric (portable generator) fans keep air constantly moving in a clockwise direction inside the dryer. Temperatures are maintained at 32 to 34 degrees C. An evening's purchase of fresh mushrooms from the pickers is completely dried by the following afternoon.

For more information,
contact Forest Fungi in beautiful Victoria, Canada



Forest Fungi

Morel Grades

We sort the DRY MORELS into four grades:

Display grade:

Prime form, 4 to 7 centimetres tall, pointed top, conic shape, tan to charcoal color, no nicks or fractures.

Culinary grade:

3 to 10 centimetres tall, may be blunt top but not round, blond to charcoal color

Plate grade:

Smaller mushrooms, twisted mushrooms, and large globe-shaped mushrooms that are suitable for quartering.

Sauce grade:

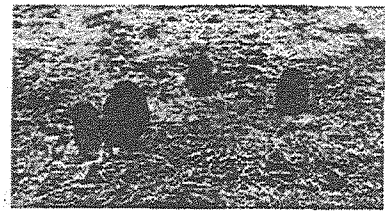
Broken pieces and the fall-through from the drying racks.

Notes:

1. All our morels have stems removed (maximum stem length = 0.5 centimetres)
2. The normal field-run is 10% select, 35% culinary, 45% plate and 10% sauce.

If you are interested in "field-run" or the "top three" say so....no sorting = savings.

For more information,
contact Forest Fungi in beautiful Victoria, British Columbia



Morel Mushrooms

From the Natural Environment of Western Canada

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Expression of interest : prices in *Canadian* dollars Morel Grades
(description) May we reserve some for you? Price Display grade Number of 100-gram bags$27 per 100 grams Culinary grade Number of 100-gram bags$22 per 100 grams Plate grade Number of 100-gram bags$19 per 100 grams Sauce grade Number of 100-gram bags$15 per 100 grams Field mix Number of 100-gram bags$20 per 100 grams who
are
you? email address
location

One hundred grams is roughly one quarter pound, and when re-hydrated will make generous servings for a sitting of 10 people. We offer discounts of 10% for orders of a kilo, and larger discounts for large volume orders. Payments may be sent by 'cheque in the mail' or bank to bank transfers. We will discuss the best shipping arrangements (depends on quantity) with you by email.

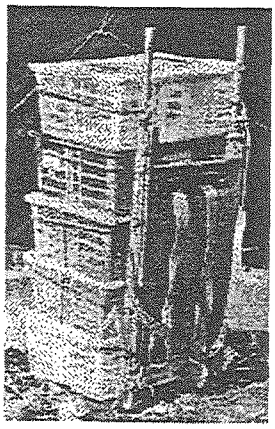
These mushrooms are harvested many hundreds of miles from any sources of heavy metal, pesticide or pollution. The flavor of the morels is rich earth and northern woods. For twenty dollars (fifteen US) try a delectable treat. You'll be back!

For more information,
contact Forest Fungi in beautiful Victoria, Canada

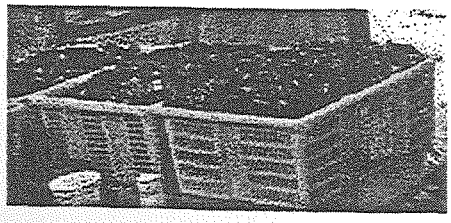
Morel Mushrooms

From the Natural Environment of Western Canada

The mushroom picking season in north-west Canada begins in spring/summer with morels in the north, moving to chanterelles from the Queen Charlotte Islands by August, then to matsutake (pine) mushrooms from Cranberry Junction and Nass areas through September and October, and south to Vancouver Island by November. Along the way, crops of boletes, sweet tooth, cauliflower and other species are gathered and sold to buyers. All the mushrooms that we collect are naturally occurring in the wild.



from packsack,
to dried delicacy



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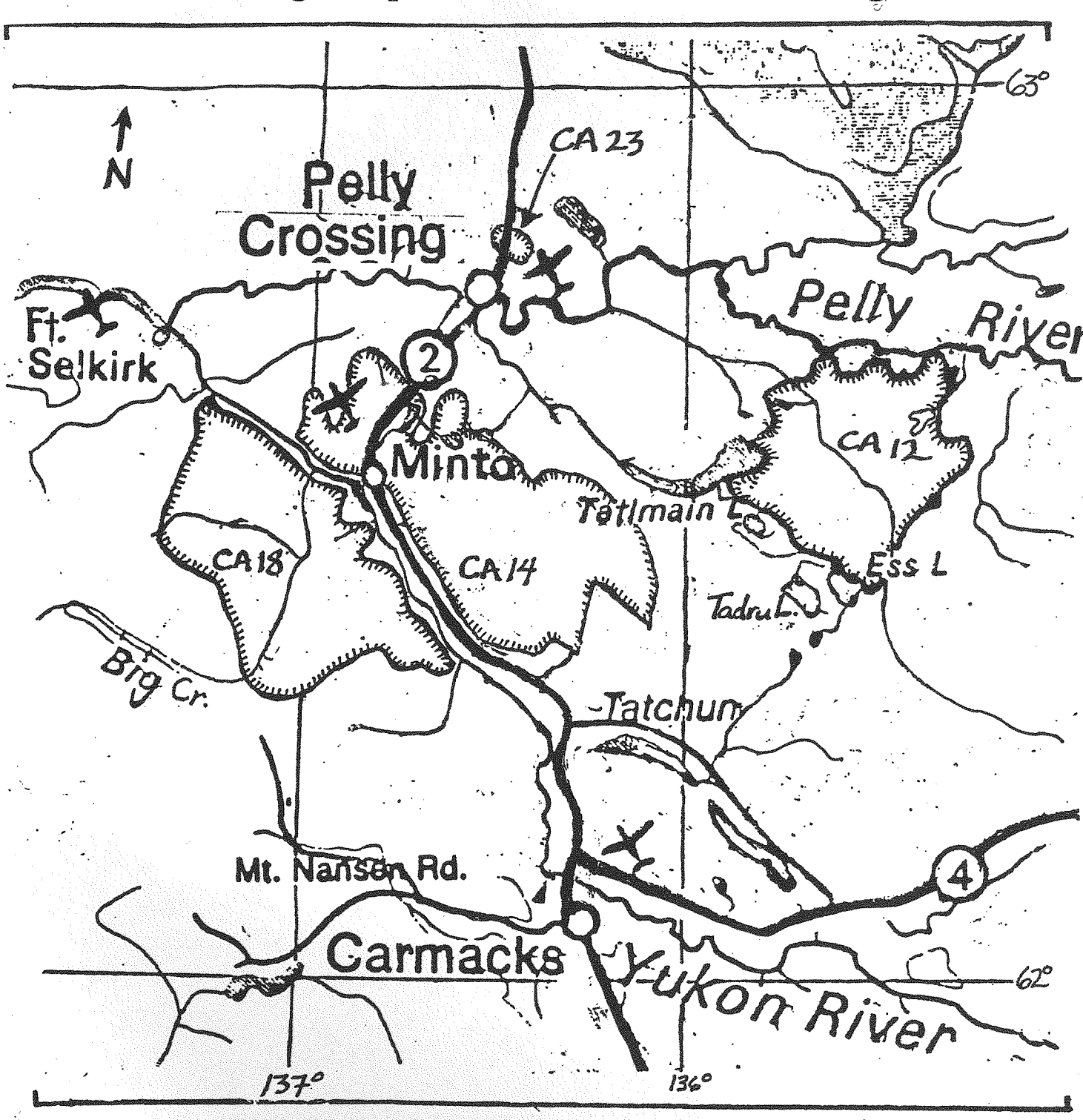
APPENDIX B

A Rough Map of the 1995 Carmacks Fire Region

Note Fires Above from Left to Right

CA 18 - 56,650 ha West of the Yukon River **CA 14 - 56,831 ha East of the Yukon River**
CA 23 - 819 ha North of Pelly Crossing, on Rt. 2. **CA 12 - 50,142 ha East of Tatlmain Lake**

A Rough Map of the 1995 Carmacks Fire Region



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