Fire History of the Fort Providence, NWT Area:

A Preliminary Assessment[1]

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INTRODUCTION

A large area north of the Mackenzie River and west of Great Slave Lake was selected as a pilot study area for development of a comprehensive resource management plan. Formed in 1990, the Fort Providence Management Plan Committee is comprised of managers and specialists from various resource disciplines within the Government of the Northwest Territories (GNWT) Department of Renewable Resources. The study area contains virtually the entire range of the Mackenzie wood bison population which is the largest free-roaming, disease-free herd in the world. In addition, moose, woodland caribou, and furbearers in the area (especially lynx) are important to the traditional native economy. Wildlife are quite specific in their vegetation requirements, and because fire has a major effect on the composition and distribution of plant communities, the committee decided that a study on the role of fire in the Fort Providence area was necessary for the development of the Plan. Subsequently, a fire history study of the Fort Providence area was initiated in the spring of 1991 as a cooperative project among Forestry Canada, the GNWT Department of Renewable Resources and the community of Fort Providence.

The purpose of this paper is to present the initial results of the study. A general description of the area, including cultural history and environmental factors influencing fire occurrence are also presented.

METHODOLOGY

Fire history was determined using several sources of information. Samples of fire scarred trees and ring counts from even aged stands provided a chronology of cross-referenced fire years. At each sample site, the vegetation and substrate were

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described in detail. Other information was derived from fire records which began in 1946, although only large fires were documented before 1962. A complete record of all known fires since 1962 was also available.

Precipitation data from Fort Providence, Hay River and Yellowknife was used to assist in identifying large fire years. The Yellowknife data begins in 1942; Fort Providence data is intermittent since 1943; and the Hay River record is continuous from 1910 to the present.

AREA DESCRIPTION

The Fort Providence study area is located between 61°-62°N latitude and 114°-118°W longitude (Fig. 1), and covers an area of approximately 10,500 km^2. It is bounded on the east by Great Slave Lake, the Mackenzie River to the south, the Horn River on the west, and the Birch Lake drainage system to the north (Fig. 2). The maximum elevation is less than 260 m above sea level, or about 100m above the level of Great Slave Lake.

Pleistocene glaciation was the most obvious force which shaped the topography, and the greatest effect on the distribution of the soil types was the impoundment and drainage of Glacial Lake McConnell. As the study area is entirely within this former basin, lacustrine plains occur in the low lying south and west, while raised glacial till, beach deposits and shallow marl lakes are more apparent in higher elevations of the central, northern and eastern portions.

The study area is located within the Upper MacKenzie (B.23a) and Northwestern Transition (B.27) Forest Sections of Rowe (1972).

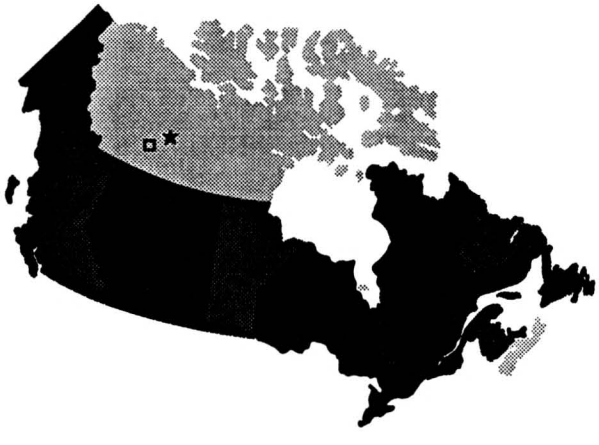

Figure 1. General location of the Fort Providence Study Area (box) and Yellowknife (star).

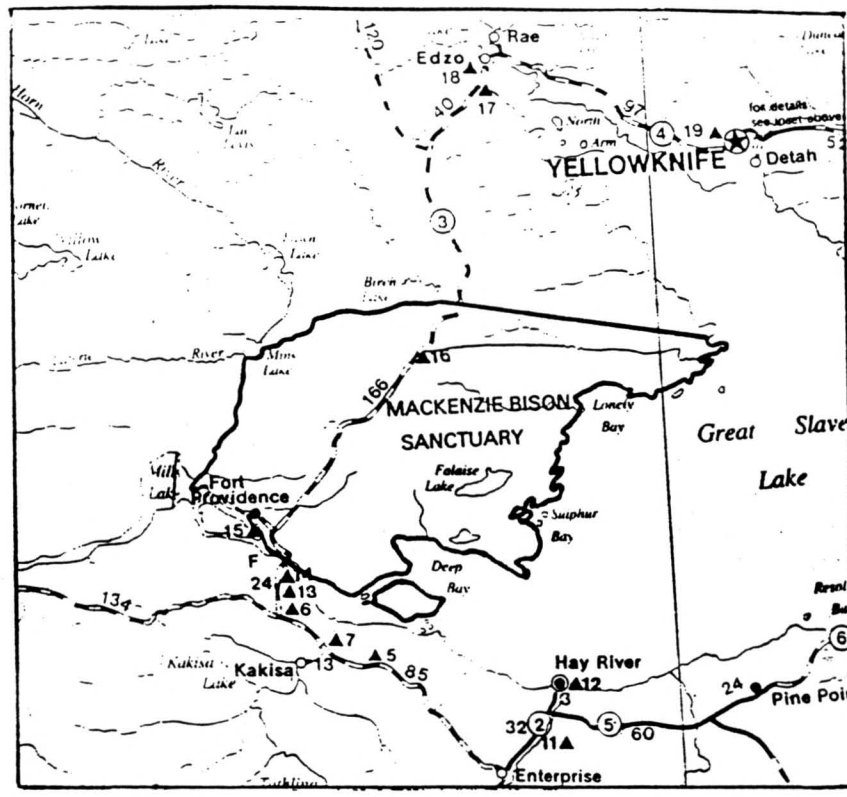

Figure 2. Boundaries of the Fort Providence Study Area (source: Government of the Northwest Territories 1989).

Plant communities consist primarily of boreal species distributed in grassland, shrubland, deciduous and coniferous forest. The south and west portions of the study area are predominantly deciduous and mixedwood stands of aspen, balsam poplar, jack pine, white spruce, black spruce, and white birch. Coniferous stands become dominant in the northern and eastern two-thirds of the area (Fig. 3).

HUMAN INFLUENCE

Most studies of this kind are complicated by the effects of increased access and recreational use of the forest, forestry operations, and a lengthy period of fire suppression. Because of the remoteness of this area, the natural ecosystems have been largely left intact. Unfortunately, this also means that there has been very little documentation of its natural history.

Fire was a tool well known to aboriginal people of western North America for wildlife habitat improvement, and Petitot (1893) and Holman (1944) have referred to similar uses in this area. Native burning was discouraged by newcomers of European descent. By 1946, a fire prevention campaign was launched in the NWT to curtail these traditional activities which were considered detrimental to resource development. Although fire protection also

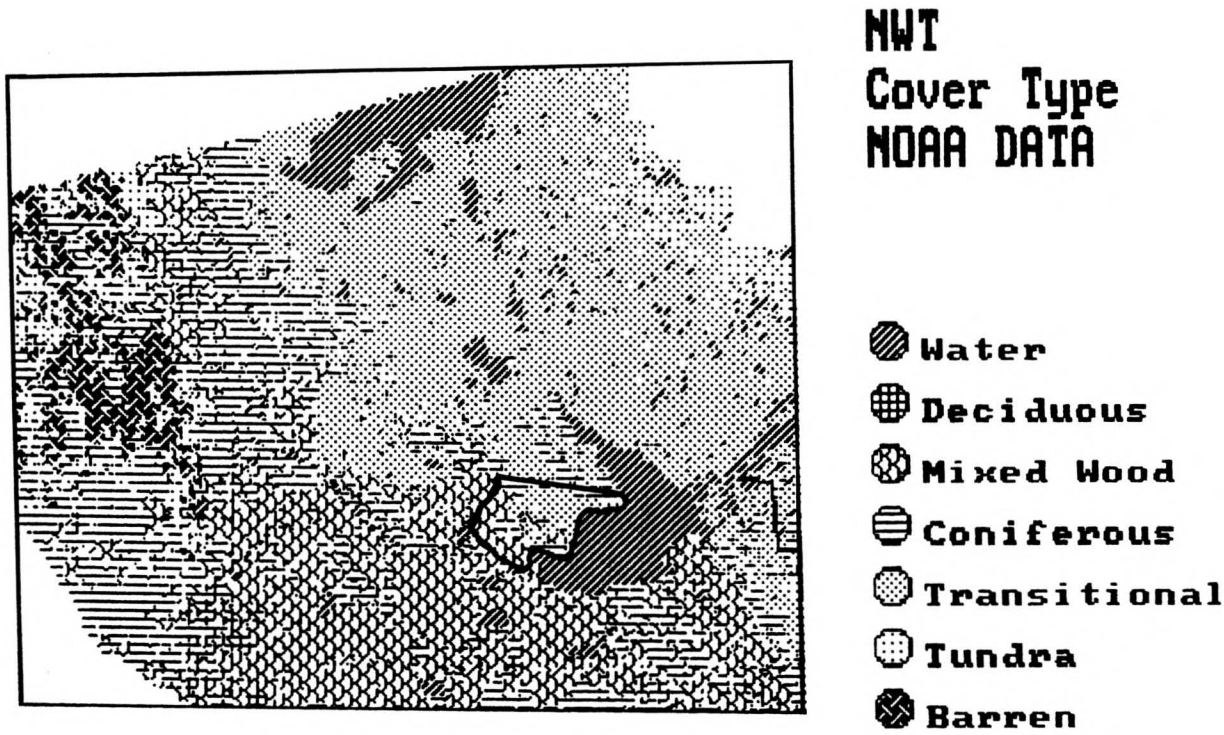

Figure 3. Distribution of vegetation cover in the study area. The transitional cover type consists primarily of coniferous species.

became organized at this time, it focussed mainly on communities and merchantable timber.

When priority zones were established in 1967, much of the study area was excluded from suppression activity. Major fire years in the NWT during the 1970's and 1980's overwhelmed the forest service, resulting in reduced influence by suppression activities. Since the replacement of the priority zone system with protection of values-at-risk in the mid 1980's, incidence of fire has been relatively low. Therefore, natural fire occurrence and spread in this area has been largely unaffected by fire suppression activities, although the cultural use of fire is likely to have occurred until 1946.

FIRE WEATHER

The fire weather zones of Canada described by Simard (1973) and illustrated in Figure 4, presents a general indication of burning conditions in the study area. Figure 4 should be viewed in relative terms, since it is a 10-year average of FWI values for the months of May to August. In effect, it illustrates the relative amount of time when extreme burning conditions exist. It is apparent that the study area is in a fairly active fire weather zone.

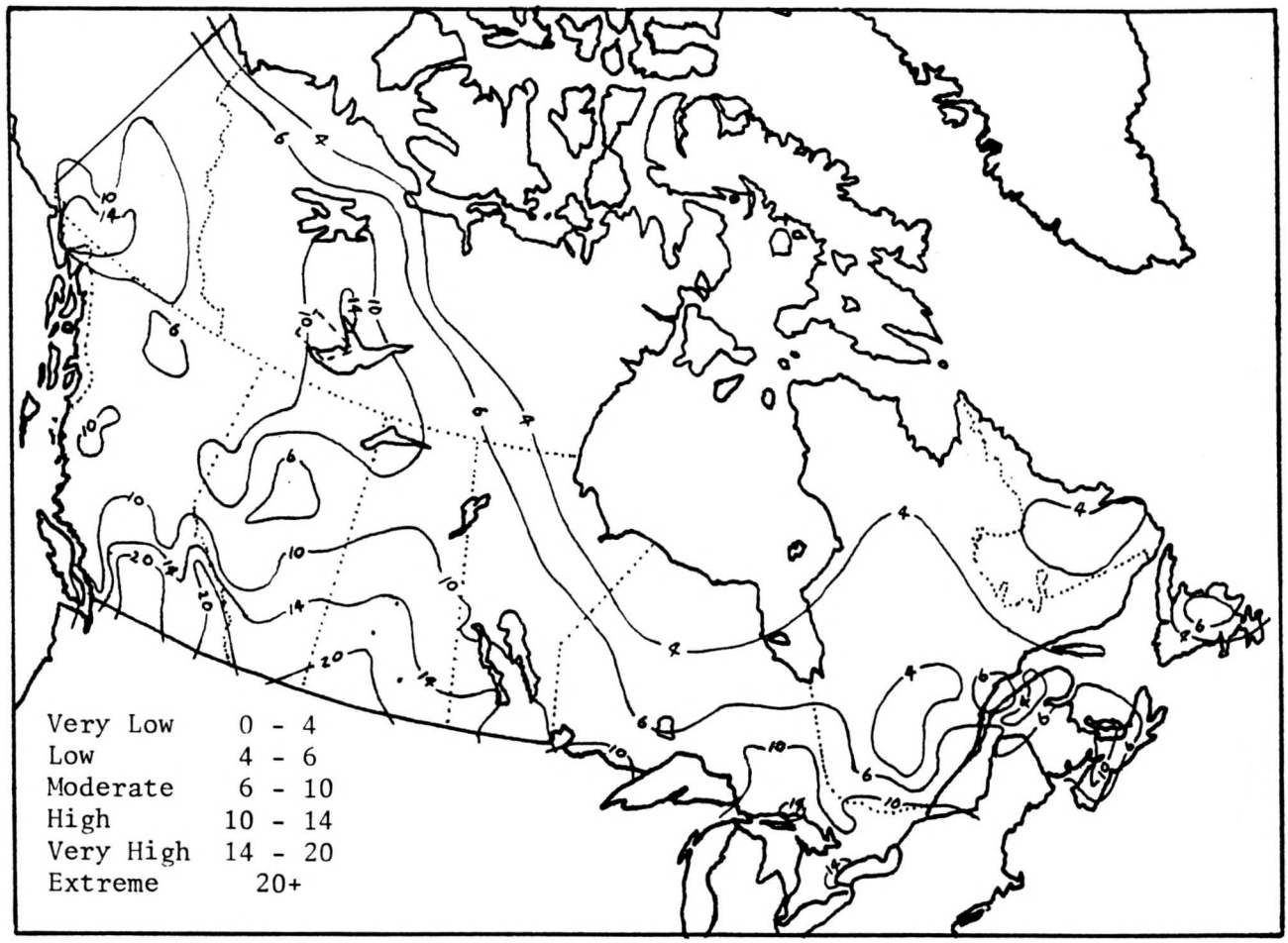

Figure 4. Fire weather zones in Canada (adapted from Simard 1973). The study area is delineated by dashed lines.

Drought Code (DC) normals for a 35-year period are presented by McAlpine (1991). The DC value is often used as an indicator of longterm drought; it represents the moisture content of deep, compact organic layers in the forest floor. Figure 5 illustrates the normals for numerous stations across Canada for the month of September. Yellowknife and Fort Smith have relatively high autumn DC values. This is exceptional considering the shorter fire season and slightly lower temperatures in the north which would cause reduced DC 's in comparison to more southern locations. Therefore, it is apparent that the study area is within a zone of generally low precipitation (on average) during the fire season.

MAJOR FIRE YEARS AND PRECIPITATION

Study results show that fires >50 000 ha occurred in the study area at least 11 times since 1880. The known years of such large fires are 1980, 1946, 1942, 1939, 1927, 1916, 1905, 1901, 1886, 1884, and 1880. Major fire years may also have occurred in

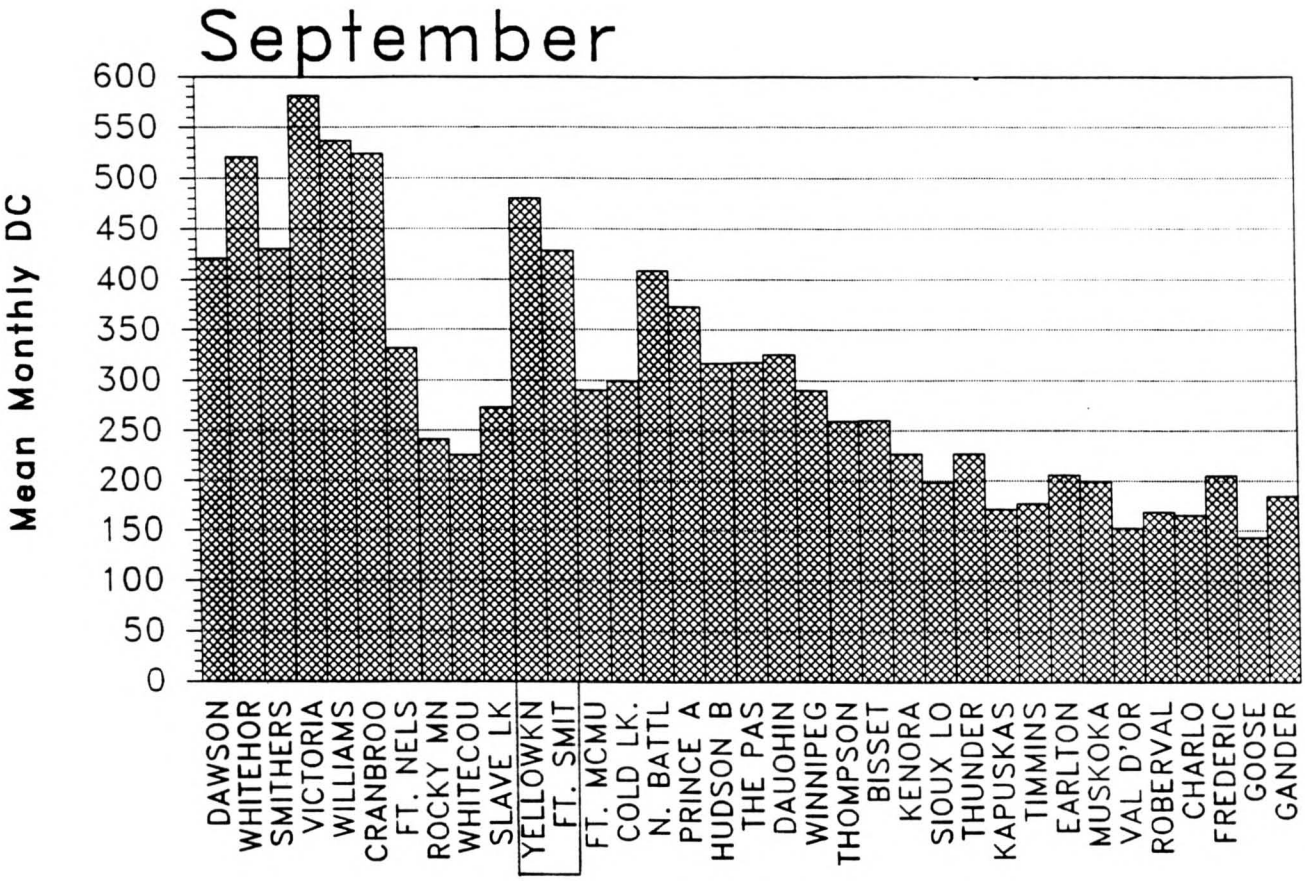

Figure 5. Thirty-five year average Drought Code values for various stations across Canada (source: McAlpine 1991).

1867, 1863, 1847, 1830, and 1805, but little evidence from these times has survived repeated stand replacing fires. The average interval between major fire years is approximately 11.3 years, while the range is from three years (1939-42) to 34 years (1946-80). The occurrence of major fire years can be compared to fluctuations in precipitation at Hay River (Fig. 6).

Prior to continuous precipitation records, there were three major fire years in the 1880's, considerable fire in the 1890's and two major fire years from 1900 to 1909. Since then, the 1910's appear to have been the decade most characterized by drought. A particularly dry period which began in 1915 culminated with the major fire year of 1916. Although precipitation was near normal during the 1920's, a drier period beginning in the spring of 1927 coincided with the burning of about 280,000 ha that year. The Hay River weather data indicates high moisture levels during the 1930's. However, extensive burning which occurred in 1939 north of the study area, and within the northern quarter, suggests that the onset of the next regional dry cycle arrived there sooner than the region to the south.

During the 1940's, the entire South Mackenzie region was dominated by drought and widespread fire. Major conflagrations in

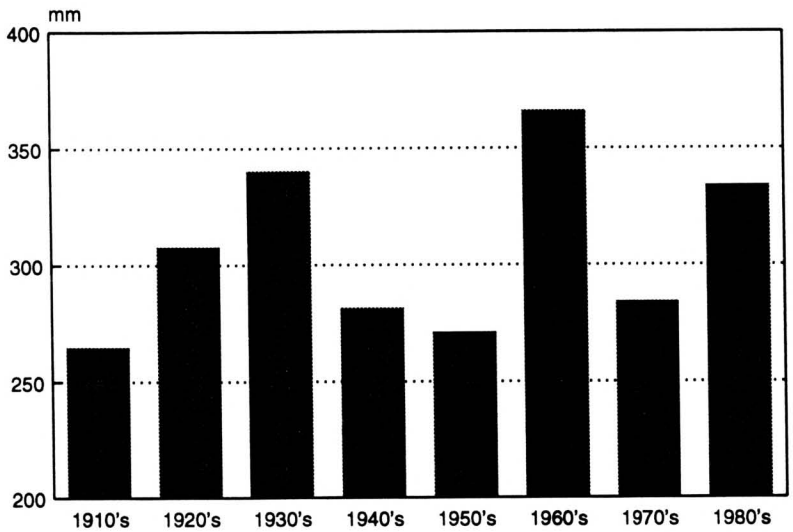

Figure 6. Summary of annual precipitation at Hay River, NWT.

1942 may have started in the spring or early summer. Major fires did not gather momentum again until August of 1946 as extreme fire weather persisted through the late summer. Although the 1950's were also characterized by low precipitation, other factors may have prevented major fire years during this period. The 1960's were relatively wet and no large fires occurred.

As drought conditions returned with the following decade, considerable area burned in 1972, 1977 and 1979. The moisture deficit increased until a major fire year occurred in 1980. In 1984, precipitation increased dramatically, signalling the onset of another wet cycle that has persisted into the 1990's. Level terrain, poor drainage and short summers are characteristic of the study area, and are conducive to cumulative moisture surpluses. At present, flooding in the study area is unprecedented in recorded history, and an unusually long period of dry weather may be required to predispose the area to major fire again.

CONCLUDING REMARKS

This status report on the fire history of the Fort Providence Study Area is based on the best information available at this time, and the field work done to date should be considered an initial foundation. As sampling continues, additional information is expected to more accurately define the extent of past fires and augment the description of the general fire regime presented in this report. Eventually, stand origin and fire occurrence maps will be produced to help interpret the distribution of vegetation types and wildlife habitat necessary for the development of an integrated resource management plan.

ACKNOWLEDGMENTS

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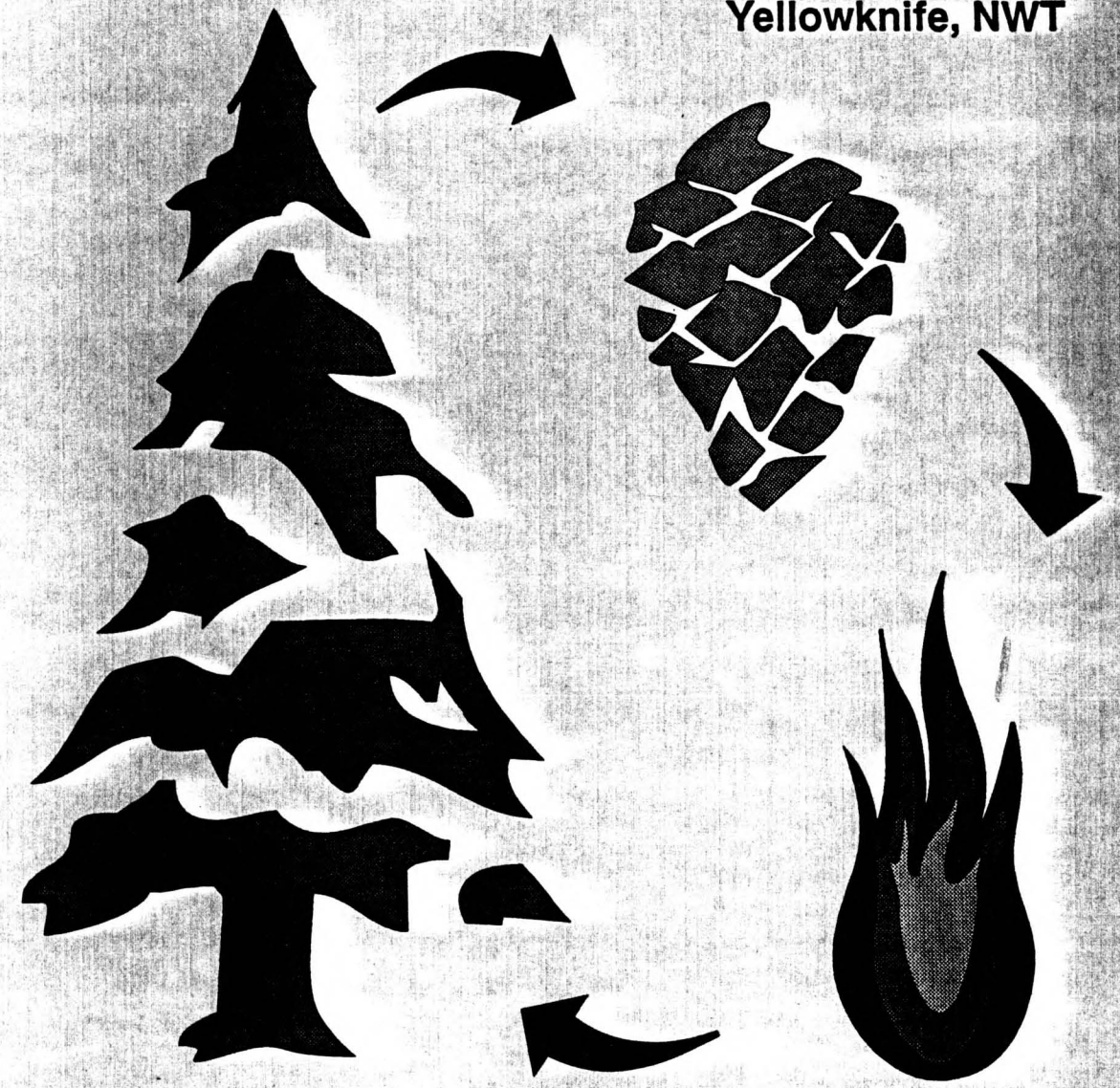

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