FORESTS, FIRES AND LOGGING

SETTING THE RECORD STRAIGHT

LEFT: OLD-GROWTH PINE AT KINDIOGAMI LAKE (LORI LABATT); CENTRE: OLD-GROWTH PINE BURN (LORI LABATT); RIGHT: CLEARCUT IN ALGOMA HIGHLANDS (TIM GRAY)

Fires have played an important role in Ontario's forests since the end of the last ice-age, 10,000 years ago. Historically, humanity has seen forest fire as a terrible force of destruction. The resulting fear of its negative safety and economic impacts have led us to suppress virtually all forest wildfire. However, fire is crucial to the normal functioning of our forests and it is time tore-examine its ecological role and how we should interact with it.

The Wildlands League has prepared this fact sheet to help you understand the role of fire in Ontario's forested ecosystems. It describes the ecology of fire and how organisms respond to it, how the ecological impacts of clear-cutting differ from those of fire, and what we can do to ensure that this important natural process continues to be a beneficial force in the evolution of both our wild and managed forests.

FIRE BASICS

Lightning and humans are the two causes of forest fires. Prior to European colonization of North America, the native people occasionally set fire to forests. This annual burning served to create a younger forest more suitable for berries and game.[2,3] After European settlers arrived, they too occasionally set fire to forests in order to clear land for agricultural purposes.[4]

More often, fires are not purposely set. In the late nineteenth and early twentieth century numerous huge fires swept across Ontario; a few killed dozens of people.[5] For example, in 1871 a fire encompassing 5180 km^2 burned much of the land between the north shore of the French River and the headwaters of the Spanish River.[5] Although most of the fires of this period were probably natural, the frequency may have been increased by human carelessness as well as sparks from coal-burning railway engines.[4] By 1917 the government began to make an increasingly concerted effort to suppress fires. This effort resulted from the view that fires have no redeeming value and from a desire to protect timber, human life and property.[5,6]

The attitude, still present today, that one tree burnt by fire means one less tree for the sawmill is inaccurate. Inaccurate because by the time some burnt areas are slated to be logged they have regrown. Forest age-class models indicate that, if fires were completely eliminated throughout all forested lands (0.1% of this area burns annually), the annual allowable cut of timber would increase only marginally.[7] Moreover, total fire exclusion is not possible nor is it ecologically desirable.

NUMBER AND AREA: Of the one to two thousand Ontario forest fires recorded annually, the majority of fires are accidentally set by people who are outdoors for recreational purposes.[8] Yet, in terms of area, human-caused fires burn only about 5% of the total area burned in Ontario[6], with lightning-caused fires burning the remainder. In 1995, a year of many lightning-caused fires, 570,000 hectares burned.[9] This was unusually high, however, and over the last 24 years the average amount of forest burned annually in Ontario was 200,000 hectares[6].

SIZE: Just as the number of hectares burned per year varies widely, so too does the size of each fire. Individual fires vary

in size from a few trees to hundreds of thousands of hectares, with a majority ranging from 10 to 50 ha in size and one or two reaching in excess of 100,000 ha. Due to their size, these few huge fires make up the majority of the total area burnt. In a part of the boreal forest of Quebec the average fire size with no fire suppression was 7,700 ha.[10] Across Ontario, with fire suppression lowering the average, the average annual fire size varies between one and 300 ha.[11] (It is unclear how much of Ontario would burn annually if there was no fire suppression.)

The patchiness of wild fire — the light areas are areas that have been less heavily damaged — is demonstrated in this picture of a fire in Lady Evelyn Smoothwater Wilderness Park.

FREQUENCY: The average frequency with which a fire will return to one part of a forest is called the fire rotation period or fire cycle. In the boreal forest the natural fire cycle was 50 to 200 years.[12] Modern fire suppression efforts have increased the cycle to between 400 and 2000 years. Some forests may burn several times in quick succession while others may go without fire for several hundred years, either because of chance or because they are located in more moist areas.

PATCHES: Fires do not burn everything in their path. Within larger fires in particular, skips or stringers remain. These are patches of trees that are left unburned. Skips may be in wet areas or downwind of fire breaks such as water bodies or bare rock. Fires covering several hundred hectares usually contain unburned island remnants of four to five percent of the total area burned.[13] These patches help to seed the burnt area and are temporary shelter for wildlife.

TYPES: A forest fire can burn through an area in various ways, depending mainly on the type and dryness of the forest. Ground fires slowly burn through the organic matter of the soil, whereas surface fires burn the top of the soil and the above-ground portion of understorey plants. Crown fires burn both the ground level vegetation and canopy of the forest. Any combination of these fire types can occur, including fires that consume virtually all organic matter above the mineral soil or bedrock.

The amount of tree canopy, organic matter, and low vegetation that are left after a fire greatly influences what grows afterwards (for instance, the amount of shade that each tree species prefers to have as a seedling is very specific). Many tree species prefer to start growing in soils that have the mineral portion of the soil exposed. This often occurs after a fire has burned away the organic matter. Fire also changes the chemical attributes of the remaining soil. It becomes less acidic and, although some nutrients disappear from the site in the form of gas, smoke and ash, the amount of soil nutrients available to plants almost always increase.[14] Together, these phenomena provide conditions for a rapid burst of plant growth following fire.

How a forest fire affects a forest, the frequency of fire, and which species will colonize the fire site depends on the type of forest region in which the fire occurs.

DECIDUOUS FOREST REGION

In the deciduous forest region of southernmost Ontario forest fires play a relatively small role. The leaves of deciduous trees are more moist and less resinous than conifers found in the north. Deciduous forests also contain less of the potentially flammable forest floor litter (fallen, undecomposed plant matter). However, certain sub-sections of this region, such as tall grass prairie and oak woodland, once burned regularly in early spring. Today, these fires are not allowed to burn because the region is highly populated.

GREAT LAKES-ST LAWRENCE FOREST REGION

The forest region that covers central Ontario is described as the Great Lakes-St Lawrence forest region. It contains a mix of deciduous and coniferous trees. Characteristic species are maples, birches, red oak, and white and red pine. The numerous lakes in this region and the presence of the less flammable deciduous species make fires less important than further north, but still more frequent than in the deciduous region.

In forests where red and white pine are dominant, fire plays an important role. When mature, these pines have branches high above the ground, away from surface fires and a thick bark that can withstand the flames of low-level fires. Under natural conditions, surface fires pass through pine forests sometimes as often as every 20 years.[15] This enables the pines to remain dominant because fires kill the competing species in the understorey. Between 70 and 300 years fires lethal to red and white pine will occur, usually with enough of the mature pines

ILLUSTRATION BY ROSALIND CHAUNDY

surviving in patches to seed the burnt areas.[15, 16] Surviving pines are necessary for the burnt area to be reseeded over the next five to ten year period. However, fire-killed red and white pine trees often contain mature cones in which seeds survive and are dispersed in the months following the fire.

White and red pine were once found in huge areas called pineries where they were the principal species.[17] In the late eighteenth and early nineteenth centuries large numbers of these pines were cut, and these once great stands converted into younger mixed-species forests.[16] Some believe that fire suppression has also contributed to the loss of these species.[5, 18] In other places the shift in forest species composition may have been caused by nineteenth century logging followed by several severe fires in quick succession. Together, these would have left little or no seed source.[16]

Jack pine is another pine species common to the northern reaches of the Great Lakes-St Lawrence region and the boreal region. Often found growing in dry rocky or sandy places, it also grows in moderately moist sites. Of all the trees of Ontario it is the species best adapted to fire. Although its bark is thin and more flammable than the white or red pine, its cones are serotinous, meaning that the seeds are sealed in with a resinous substance. This resin only melts at temperatures of 55°C or higher.[19, 20] Unlike many other conifers whose cones drop off annually, the sealed cones stay on the tree for decades until a fire occurs. In fact, jack pine cones are very tough, withstanding temperatures of 900°C for short intervals.[19] After the fire, most of the cones survive, but in a newly opened state, spreading their seeds onto the recently enriched ground. Jack pine seedlings need both an unshaded environment and mineral soil with a small amount of humus to grow. These conditions are common after a fire.

Many older trees can withstand fire as did this fire-scarred red pine.

Jack pine are well-adapted to frequent fire since they can produce enough cones as early as its thirtieth year to successfully reproduce themselves after a fire. In contrast white pine does notstart good seed production until its fiftieth year.

Jack pine are a relatively short-lived tree species, living to about 150 years, or at most 200 years if not killed by fire. In most jack pine forests other species, such as black spruce, balsam fir and some deciduous species will begin growing underneath the canopy as the forest ages. Left unburned this forest will eventually change to one dominated by these other species.

BOREAL FOREST REGION

The huge expanse of the boreal forest covers most of Northern Ontario. It is dominated by coniferous black spruce, balsam fir and jack pine. Deciduous species such as white birch and trembling aspen are also very common. Fires have always been integral to the survival of these forests. Without them, the existing mosaic of many-aged and multi-species stands would not exist. It is in the northern parts of this forest that fires still sometimes burn unchecked. One of the reasons they are allowed to burn is because it is too expensive to fight every fire.[1] Also, there is still less interest in the timber in these difficult-to-access parts of the province. And recently the place of fire in the environment has been acknowledged.

Most of the abundant tree species in the boreal forest are well adapted to fire. Black spruce produce cones that sit high up on the tree where they are less likely to be destroyed by fire. In non-fire years the cones open in late summer and over the next several years disperse their seed. The samehappens in a fire year, but the warmth of a fire greatly encourages the semi-serotinous cones toopen. Like jack pine, black spruce seedlings survive better following germination on mineral soil. White birch and trembling aspen will re-sprout from their roots after a fire, even if they are badly burned. Many shrub species, however, will not re-sprout if their roots are badly burned. Furthermore, unlike heavy conifer seeds that fall close to the parent tree, birch and aspen seeds are light and easily windblown into a new area from some distance away.

Which tree species grow after fire therefore depends on many variables. These include: the species that were there before the fire; the severity of the fire; length of time between burns; what part of the boreal forest the fire occurred in; the size of fire; and whether the land is moist or dry. With these many variables at play, it is difficult to predict which species will re-populate a site after a fire.

Nonetheless, it is generally accepted that black spruce forests usually replace themselves after fire.[21, 22] Seedlings gradually grow in over the following 25 years.[26] Conversely, herbaceous plant, lichen, and moss communities do not replace themselves but change over the years, as the levels of nutrients and shade change. Grasses and flowers often move quickly into a burnt area as they enjoy bright sun, warmer soil and increased nutrients, but after a few years they decline in abundance as other species establish. In many black spruce forests the dominant moss and lichen species change several times.[22, 23] Often lichens such as *Cladina* dominate the ground cover for many decades, sometimes persisting until the next fire; in other cases a mature forest floor is almost completely covered by feather mosses.[21]

Occasionally black spruce is replaced after fire by aspens and birch, particularly in the southern boreal forest where the latter species are more common.[21] This can happen when the interval between fire is so short that the spruce were not old enough to produce sufficient seed. Thus without spruce seeds present, aspen, birch or other hardwood seeds can blow in and revegetate the site.

Fire destroys — and renews.

Spruce is also replaced by other species. This occurs when a fire is so intense that it completely burns the spruce and its seed-bearing cones. Again, aspen and birch may seed in or, if the site is dry, jack pine may become established if there is a seed source not far away. Species with windblown seeds are especially likely to dominate the site if the fire was severe and large so that spruce seeds from the edge of the burned area cannot reach the interior. Yet fires that kill black spruce seeds are relatively rare because fires usually move through the crowns too quickly to destroy all the seeds, leaving the cones only scorched.[24]

If deciduous species have come to dominate a site after fire, for whatever reason, spruce or balsam fir will inevitably move in after some time has passed.[25] Balsam fir, which does not survive fire or reproduce itself using fire, prefers to start its life in a shady environment. It is often found as part of a mixed forest or growing up under the canopy of another species. The presence of balsam fir in a forest usually reflects longer fire return intervals.

FIRE VERSUS CLEAR-CUT LOGGING: HOW DIFFERENT?

For years, debates and controversies have arisen over the issue of whether or not clear-cut logging has similar ecological impacts to fire. While there are some similarities, there are many more differences.

SIMILARITIES: Clear-cut logging and fire may resemble each other to the untrained eye. This is because most of the tree canopy on the site is no longer present. Both types of disturbance allow significantly more sunlight reach the ground, increasing the abundance of this important plant growth factor.

Both disturbances result in some degree of soil erosion and runoff of materials due to the decrease in supporting vegetation.[26, 27] The amount of runoff is quite variable for both depending on the severity of fire, method of clear-cutting and site conditions. Finally, both clear-cutting and fire almost always regenerate to a new forest; the problem is that they do not always regenerate to the same type of forest.[28]

DIFFERENCES: One difference between clear-cutting and fire is that numerous standing dead trees usually remain after a fire. This is not so in a clear-cut where if trees are left they are scattered live trees. Dead trees reduce wind velocity and provide partial shade and habitat for some animals. Also, there are usually few patches of any species left within a clear-cut, particularly conifer species. Thus, there is less chance for these types of trees to reseed the cut.

The amount of above ground material removed from the site differs. With fire, some material is turned to ash and some leaves the site as gas and smoke. Particulate matter in the smoke mostly falls elsewhere in the forest.[14] With clear-cutting, more material leaves the site to be transformed into lumber, pulp and paper. When full-tree harvesting is used, trunk, top and branches are removed from the site. The advantage to leaving branches scattered over the site is that this material (which contains more nutrients than the trunk) eventually decays, then enriches and builds the soil. Whichever cutting method is used it is important to ensure that the time between harvests is long enough so that the nutrients and soils have time to rebuild to their former levels.[27, 29]

Conversely, logging tends to leave more soil material on the site than fire. Although this aids in the soil rebuilding process, heavy logging machinery often redistributes, ruts and compacts the soil.[30, 31] Compaction is a problem because

studies have shown that seedlings have greater difficulty growing in soils that have lost their natural aeration.[29] In the Canadian boreal forest these problems can be somewhat mitigated if harvesting takes place when the soils are frozen.[30]

Over centuries one effect of the intense heat of wildfire is that rocks and boulders shatter and ultimately become soil.[29] Logged sites that are rocky or have bedrock close to the surface do not gain this benefit. Severe fires also remove many fungi and insects, including tree pathogens, from the site. However, many microorganisms rapidly recolonize the site.[29, 39]

Finally, logging, unlike fire, requires roads. New roads, bring many impacts, including a change in the behaviour of some animals and greater hunting and fishing pressure.[29]

SOLUTIONS

Change in the composition of the boreal forest has occurred because logging differs from fire.[27, 28, 31] Logging has caused a decided shift towards forests of white birch, aspens and balsam fir and a decline in spruce and pine forests. While deciduous species do sometimes replace spruce following fire, a significantly greater conversion to different species occurs following clear-cutting. The ecological and economic implications of this conversion are worrisome. Ecologically, the wildlife adapted to conifers have less habitat available. These animals include pine marten, three-toed and black-backed woodpeckers and woodland caribou. We may also be reducing the genetic diversity of some plant and tree species as their populations shrink over large areas.

TIM GRAY

Clearcutting has many impacts including soil compaction.

Economically, the lack of conifers will result in shortages of softwood timber for the forest industry, and a need to adapt mills for deciduous species. (See the Wildlands League's Forest Diversity/Community Survival Fact Sheets #2-3 for further information). Thus, we need to recognize that clearcutting does not mimic fire and we need to discover ways to re-introduce fire's beneficial effects into the managed forest and also ensure that there are wild places where its positive natural effects can continue unchecked.

I) PROTECTING WILD FORESTS

Ontario has 45 different ecological regions in the boreal and Great Lakes St. Lawrence forest zones. We need to complete the job of protecting areas of wild forest within each of these that are large enough to allow for the continuation of natural wildfire. The absolute size of these wild reserves will need to vary depending on the forest type, rainfall patterns, geography and surrounding land-uses. Once these areas are established, and several have been (eg. Quetico, Wabakimi, and Woodland Caribou Parks), we must develop fire management plans for each of them that recognize the desirability of having fire continue, while also recognizing that we will need to determine the best way for this to occur.

II) CHANGING THE WAY WE LOG

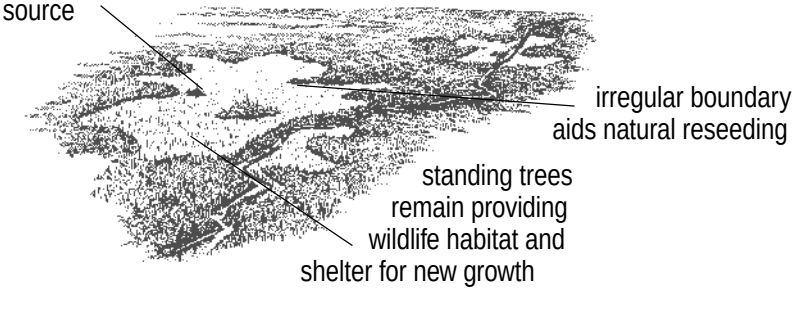
It should be standard logging practice to leave patches of healthy, mature conifers. This would provide seed sources and wildlife shelter. Currently the tree patches left after clear-cutting are often in difficult-to-log wet areas. In other instances, pockets of younger trees or species not desired by the forest industry are left behind.[28] Since black spruce and jack pine are highly prized in the boreal region, aspen and white birch are left behind in disproportionate numbers. These tree species then easily seed into the surrounding cut areas. We need to carefully examine wildfires and ensure that the residual patches in clearcuts match the size, location, and frequency of occurrence of patches within burnt areas.

The size and shape of clear-cuts could theoretically be changed to more closely approximate fire. Where clear-cut edges are now straight and angular they could be altered to become irregular. Mimicking the range of wildfire sizes requires knowledge of how fire is occurring naturally in the region. The cut sizes could approximate the range of sizes and frequency found in a natural state. On the other hand, proposing clear-cuts of 1,000 to 10,000 hectare size is questionable, when the actual site impact remains structurally and chemically dissimilar to fire.

Keeping areas of old-growth forest uncut should be a routine practice given that some forest patches survive untouched by fire for centuries. The amount of old-growth forest left unlogged on the landscape should be similar to the

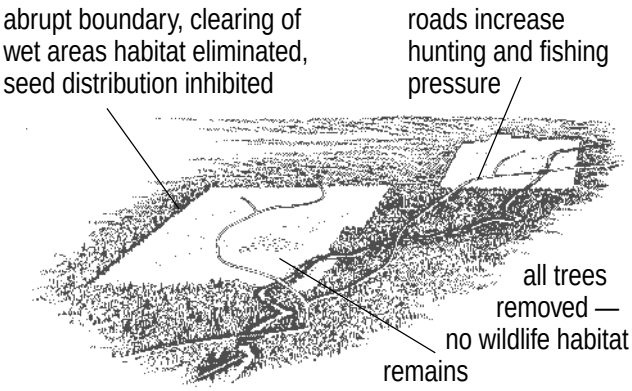
DOES CLEARCUTTING MIMIC THE EFFECTS OF FIRE?

FOREST FIRE



- kills pathogens (rot, insects, fungi); smoke kills pathogens outside fire area
- breaks rocks through heating & cooling, which builds soil
- releases the nutrients phosphorus & calcium from leaf litter into soil
- stimulates growth of nitrogen-fixing plants
- allows individual trees and forest patches to survive, providing seed source, wildlife habitat & old-growth features in new forest
- leaves standing trees, fallen logs & root networks, reducing sediment runoff
- encourages conifer growth; heat stimulates cone opening, reduces competition from hardwoods and ensures natural seed supply
- retains genetic diversity of tree species, allowing adaptation to new conditions

CLEARCUT LOGGING



- allows pathogens to survive
- heavy equipment promotes soil rutting, compaction, erosion
- depletes site by removing nutrient-rich leaves & twigs
- discourages nitrogen-fixing plants
- completely removes standing trees; eliminates wildlife habitat, seed source, old-growth features
- clears site of trees, allowing high level of sediment runoff
- stimulates shade-intolerant hardwoods by creating full sun conditions without heating soil; supports species conversion of forest
- drastically reduces genetic diversity in regenerating forest

CHARLES DREVER

amount that would be expected to be left unburned under natural circumstances.

A greater use of prescribed burning could make the site specific impacts of clear-cutting closer to those of fire.[32] Prescribed burns are intentionally set fires; in the boreal forest they are usually set in newly cut areas. Currently the main reasons prescribed burns are undertaken are to remove branches and other logging waste, to expose more mineral soil, and to produce better growing conditions for conifers.[19] In 1994 only 800 ha of post-clearcut sites were burnt by the Ministry of Natural Resources, continuing a decline in the use of this technique. Over the last several decades prescribed burns averaged a few thousand hectares annually; a very small portion of the total area clear-cut annually[33] (just under 200,000 ha[6]).

Jack pine is known to regenerate poorly after logging unless some sort of post-cutting treatment at the site is done.[19] Scarification followed by seeding or tree planting is preferred by Ministry of Natural Resources and the forest industry. While this succeeds in encouraging regrowth of jack pine, prescribed burning would also regenerate jack pine and would have the added benefit of resembling wildfires in other ways. The best way to emulate fire and bring back the pines would be to leave standing jack pine seed trees throughout the cut area and then burn the site.[24] If a prescribed burn is done on logging slash the fire lasts too long and burns the cones completely. Also, if burning is not done soon enough after cutting, cones in contact with the ground will start to decompose.

If prescribed burns were used more often, these areas would receive a quick input of nutrients, some of the excess organic matter would be removed, and competing vegetation would be reduced. These chemical and biological changes would lead to a better environment for the herbaceous plant, lichen and moss species which prefer a post-fire environment.[34, 35] These species are often ignored when the focus is on the tree species which regrow after cutting.

Controlled burns should also be considered as an option in red and white pine management. Prescribed burns in mature forests could maintain the natural composition of these forests. Prescribed burns would approximate natural surface fires by removing some of the litter layer and by reducing the amount and vigour of competing vegetation such as young balsam fir and beaked hazel.[18] If cutting is planned, a burn should proceed before a shelter-wood cut.[18] This method requires that numerous trees are left, both to serve as a seed source and to partially shade new seedlings that will grow on the prepared soil.

Prescribed burns are not necessarily appropriate for all situations, such as where bedrock is close to the surface, on steep slopes or where the trees have a good chance of regenerating naturally (such as some poorly-drained, lowland black spruce sites).[28] Prescribed burns also have the added disadvantage of needing special weather conditions to ensure they do not get out of control. Nonetheless their use in many parts of Ontario's forests would have numerous ecological advantages over other post-logging treatments.

To find out what we need to do and how to get involved, see back page.

REFERENCES

1 - Goodman, J.F. 1985. Realities of managing fire in Ontario. Forest Fire Management Symposium. Great Lakes Forestry Centre, Canadian Forestry Service.

2 - Alexander, M. E. 1980. Forest fire history research in Ontario: A problem analysis. In Proceedings of the fire history workshop, M.A. Stokes & J.H. Dieterich (Tech. Coord.), Tuscon, Arizona. U.S.D.A. Forest Service General Technical Report RM-81. Pp 96-109.

3 - Tolonen, K. 1983. The post-glacial fire record. In R.W. Wein & D.A McLean (Eds.), The Role of Fire in Northern Circumpolar Ecosystems. SCOPE 18. John Wiley & Sons Ltd., New York. Pp. 21-44.

4 - Keddy, C. 1994(Rev). Forest History of Eastern Ontario. Information Report #1., Eastern Ontario Model Forest. Kemptville, Ont.

5 - Day,R.J., & J.V.Carter. 1991. The ecology of the Temagami forest: Based on a photointerpretive survey and the forest resources inventory of Temagami district. Ontario Ministry of Natural Resources.

6 - Canadian Council of Forest Ministers. 1995. Compendium of Canadian Forestry Statistics 1994. Natural Resources Canada, Ottawa, Ont.

7 - Van Wagner, C.E. 1985. Fire, harvesting and timber supply. In Forest Fire Management Symposium. Canadian Forestry Service, Great Lakes Forestry Centre.

8 - Ministry of Natural Resources. 1990. Forest Fire Management in Ontario. Toronto.

9 - Mutton, W.(Ed). 1995. Future Think: The new firefighting tool. Aski. 21(1):4-5. Ontario Ministry of Natural Resources.

10 - Payette, S., C. Moreau, L. Sirois & M. Desponts. 1989. Recent fire history of the northern Quebec biomes. Ecology 70(3): 656-673.

11 - Ontario Ministry of Natural Resources. 1991. Statistics 1989-1990.

12 - Rowe, J.S. & G.W. Scotter. 1973. Fire in the boreal forest. Quaternary Research. 3:444-464.

13 - Eberhart, K.E. & P.M. Woodward. 1987. Distribution of residual vegetation associated with large fires in Alberta. Canadian Journal of Forest Research 17:1207-1212.

14 - Forests for Tommorrow. 1987. Ecological issues of fire, climate change, air pollution, and acid rain in Ontario forests. Witness Statement #1A, In the matter of the Environmental Assessment Act (R.S.O. 1980, c.140) as amended: and In the matter of a hearing before the Environmental Assessment Board regarding a Class Environmental Assessment for Timber Management on Crown Lands in Ontario.

15 - Heinselman, M.L. 1981. Fire and succession in the conifer forests of northern North America. In Forest Succession, Concepts and Application, Eds. D.C. West et al, Springer-Verlag, New York. Pp. 374-405.

16 - Cwynar, L.C. 1977. The recent fire history of Barron Township, Algonquin Park. Canadian Journal of Botany. 55:1524-1538.

17 - Brown, J-L. 1994. White pine management in the Ottawa area of Quebec. The Forestry Chronicle 70(4):437-445.

18 - McRae, D.J., T.L.Lynham & R.J. Frech. 1994. Understory prescribed burning in red pine and white pine. The Forestry Chronicle 70(4):395-401.

19 - Cayford, J.H. & D.J. McRae. 1983. The ecological role of fire in jack pine forests. In R.W. Wein & D.A McLean (Eds.), The Role of Fire in Northern Circumpolar Ecosystems. SCOPE 18. John Wiley & Sons Ltd., New York. Pp 183-199.

20 - Kimmins, H. 1987. Forest Ecology. New York: Macmillan. 531pp.

21 - Viereck, L.A. 1983. The effects of fire in black spruce ecosystems of Alaska and northern Canada. In R.W. Wein & D.A McLean (Eds.), The Role of Fire in Northern Circumpolar Ecosystems. SCOPE 18. John Wiley & Sons Ltd., New York. Pp 201-220.

22 - Morneau, C. & S. Payette. 1989. Postfire lichen-spruce woodland recovery at the limit of the boreal forest in northern Quebec. Canadian Journal of Botany 67:2770-2782.

23 - Foster, D.R. 1985. Vegetation development following fire in *Picea mariana* (black spruce)-*Pleurozium* forests of south-eastern Labrador, Canada. Journal of Ecology 73:517-534.

24 - McRae, D.J. Canadian Forest Service, Sault Ste. Marie. Personal communication.

25 - Bergeron, Y. & P-R. Dansereau. 1993. Predicting the composition of Canadian southern boreal forest in different fire cycles. Journal of Vegetation Science 4:827-832.

26 - Cwynar, L.C. 1978. Recent history of fire and vegetation from laminated sediment of Greenleaf, Algonquin Park, Ontario. Canadian Journal of Botany 56:10-21.

27 - Natural Resources Canada and Canadian Forest Service. 1994. The State of Canada's Forests, 1993: Forests, A Global Resource, Fourth Report to Parliment. Ottawa.

28 - Ontario Independent Forest Audit Committee (lead by K.W. Hearnden, S.V. Millson & W.C. Wilson). 1992. A Report on the Status of Forest Regeneration. Ontario Ministry of Natural Resources.

29 - Wuerthner, G. 1995. Ecological differences betweeen logging and wildfire. Wild Earth, Summer:40-44.

30 - Natural Resources Canada and Canadian Forest Service. 1995. The State of Canada's Forests, 1994: A Balancing Act. Ottawa.

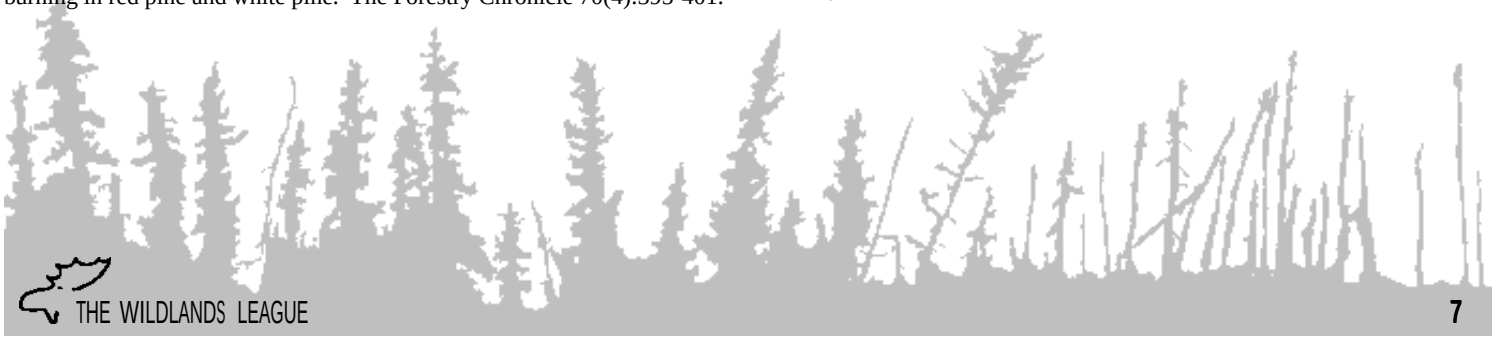
31 - Carleton, T.J. & P.MacLellan. 1994. Woody vegetation response to fire versus clear-cutting:A comparative survey in the central Canadian boreal forest. Ecoscience 1(2):141-152.

32 - Chrosciewicz, Z. 1978. Silvicultural uses of fire in midwestern Canada. Northern Forest Research Centre, Canadian Forestry Service.

33 - Elliot, B. 1988. Prescribed burning in Ontario. Statement of evidence panel XI - Renewal Document #4, In the matter of section 12(2) and 12(3) of the Environmental Assessment Act (R.S.O. 180, c140) as amended.

34 - Johnston, M.H. & J.A. Elliott. 1996. Impacts of logging and wildfire on an upland black spruce community in northwestern Ontario. Environmental Monitoring and Assessment 39:283-297.

35 - Abrams, M.D. & D.I. Dickmann. 1982. Early revegetation of clear-cut and burned jack pine sites in northern lower Michigan. Canadian Journal of Botany 60:946-954.



WHAT WE NEED TO DO

➤ Acknowledge that fire is a natural and positive force in the environment. Many park and natural reserve managers have come to accept and welcome wildfire. It will be a challenge for public land and forest managers to do the same.

➤ Protected areas in each of Ontario's 65 natural regions should be established. These sites would include some large wilderness parks where fires can burn unchecked. This would provide areas where forested ecosystems can continue to function naturally and where fire can be studied.

➤ Reduce fire-suppression activity where it does not threaten people and property. Accept that fire will slightly reduce the amount of available timber.

➤ Acknowledge the many ecological differences between fire and logging; make changes to clearcutting practices; and increase the use of prescribed burning. Such changes would help to reduce the impacts that industrial logging has on our forests.

HOW YOU CAN GET INVOLVED

➤ Participate in your local forest management planning process. Public comment is an important component of the management of Ontario's crown lands. Prescribed burning may be appropriate but is not always considered. Make sure that plans are in place to maintain the species that originally occurred on a cut site.

➤ Write to MNR to ask how they are changing clearcutting practices to more closely approximate fire and other natural disturbances. Ask them why prescribed burning is not used more frequently.

➤ Write to Premier Mike Harris and encourage him to keep his promise to complete a system of wild areas where natural processes can continue. (Rm 281, Legislative Building, Queen's Park, Toronto, ON, M7A 1A1)

WRITTEN BY ROSALIND CHAUNDY AND TIM GRAY

The **Wildlands League** is a non-profit, conservation organization dedicated to the protection and conservation of Ontario's parks and wild areas. The League is an Ontario chapter of the Canadian Parks and Wilderness Society (CPAWS).

The Wildlands League has a two-pronged approach to conserving biodiversity. The first is the protection of wild places through the completion of a system of ecologically representative protected areas. The second is to promote ecologically centred resource use and planning. The League is committed to promoting awareness of ecological principles and the inherent values of wild places through public education and involvement in our activities.

Currently the League is involved in three major programs:
* Endangered Spaces and the Algoma Highlands Campaign
* Algonquin Park Watch Program
* Forest Diversity/Community Survival Project

If you would like to become more involved in conservation in Ontario or would like to support our work, please contact us.

WILDLANDS LEAGUE
401 Richmond St.W., Suite 380
Toronto, ON, M5V 3A8
Phone (416)971-9453
Fax (416)979-3155
E-mail: wildland@web.net
Home page:
http:/web.idirect.com/~wildland