

THE MYTH OF FIRE

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The idea that fire has a cleansing and renewing value long predates written western history. The symbol of the phoenix, a mythical bird which in old age returns to its nest and creates a conflagration from which a young bird arises, is found in ancient texts from Egypt, India, China, and Arabia. In the Western Judeo-Christian tradition, the idea of fire introduced or informed many of the allegories of resurrection. For example, according to the Torah, or Old Testament, humankind was to experience a second, fiery cleansing before the final resurrection. Further, the practice of burning at the stake so popular in the correction and punishment of heretics and witches in Christian Europe was justified by the idea that their corruption could only be cleansed by fire, an action which enabled the soul to be reborn. Professor Northrup Fry has pointed out how corruption, cleansing and renewal are the common sequential elements in all such fiery myths.

We present this brief analysis of the myth of fire to demonstrate the power and ancient roots of its modern incarnation as a Kuhnian paradigm for understanding the ecology of the boreal forest. Kuhn suggests that science creates paradigms which drive and order research, and that the paradigms change only when the drive for evidence to sustain them produces so much contrary evidence that the paradigm cannot be sustained. This, he argues, is a slow process because the paradigm to a greater or lesser degree both directs

the search for, and defines the nature of, evidence. How much more powerful such a paradigm must be if it is also based on one of our cultures most ancient and powerful myths.

The fire paradigm structures our thought about the boreal forest in three principle ways. First, it creates an assumption for an inherent, potential need for cleansing by fire as the inevitable outcome of aging, decay, infection, or for falling away from a predetermined norm. Second, the paradigm precludes seeing fiery cleansing apart from decay, or renewal apart from fiery cleansing. Third, the paradigm locates the search for evidence of any and all natural processes within itself, e.g. fluctuations in populations of passerine songbirds in the boreal forest must be related to fire frequency.

It is our contention that the idea of fire as the necessary cleansing agent of the boreal forest has become a Kuhnian paradigm which seeks to justify itself by directing research and defining evidence. We will establish this by presenting evidence which suggests that other growth and regenerative processes in the forest exist but are being ignored because the fire paradigm operates to insure that only data which support (or are made to support) the fire paradigm are considered. We conclude by speculating on the possibility that this paradigm is malign because it encourages human actions which are, in fact, detrimental to the survival of the boreal for-

est. We make no claim as to the role of fire on any other landscape but the boreal forest.

It is a given that organisms are born, age, and die. What is not a given is that senescence, old age, decay, or any such condition, is necessary for the reproduction of all or even a majority of the species of the boreal forest, or for the reproduction of the forest itself as a whole. The five high-trunked coniferous trees which form a large part of the biomass of the boreal forest—white spruce (*Picea glauca*), black spruce (*Picea mariana*), jack pine (*Pinus banksiana*), balsam fir (*Abies balsamea*), and tamarack (*Larix laricina*)—produce seed throughout their long life spans. We know from scientific observation that these seeds germinate and grow under ecologically limited conditions. Thus, the seeds which succeed in becoming reproductive trees are doubly limited. However, scientific observation also shows that in a non-managed forest sufficient numbers of seeds do succeed to insure that it is nowhere demonstrable that any tree species are disappearing or that the seedlings that survive to maturity come from any particular age or other class within the species. What has also been demonstrated is that many of the seeds which germinate and the seedlings which survive are able to do so because of traumas suffered by those organic components of the forest which impose the limits on the seeds' reproductive success. Contrary to the predictions of the fire paradigm, these traumas are of many sorts and may affect trees of any age. Further, while disease, predation, wind, water, foresters, and fire are all such traumas, of these only some forms of disease are commonly associated with senescence and decay.

Much of the discussion on the boreal forest uses terms like "overmature

stands," "senescent stands," "disease-prone trees," and "fire-prone stands". All of these phrases describe the forest in terms of problems requiring cleansing by fire. Yet the outline of reproductive success given in the previous paragraph does not indicate that survival of the species is necessarily dependent on fire or that traumas which encourage species survival are necessarily cleansing. Rather, the controlling fire paradigm demands that emphasis be placed on the need for cleansing and so all boreal processes are interpreted as being linked to cleansing by fire. For example, deaths of trees due to agents other than fire are not seen as parts of non-fire processes. Instead, the phenomena of dying trees is labelled as a universal process of "fuel-loading," a sub-process of the fire paradigm.

The fire paradigm thus creates its own facts in support of itself. The literature on the role of fire in the boreal forest, gratuitously written by the large number of forest professionals who plan to use (or mimic) fire as a tool in forest management, makes it clear that fire is the essential cleansing agent in the forest. Yet, apart from an evangelical desire to conform to mythic content, it is not clear why fire should be singled out for this role. Despite the fact that a body of literature exists which demonstrates that bronze bore, spruce budworms, and aspen tortix also create a widespread devastation of trees which also leads to forest growth, there is as yet no appreciable amount of literature elevating these processes to mythical status.

The fire myth holds that renewal by fire is the pathway to health and continuity in the boreal forest. A host of studies presently being done illustrate that a confirmation of this role for fire is being ardently sought. The primary purpose of these studies is to establish a cycle of fire frequency which can be

usually linked to species diversity. While these studies are basically designed to provide an understanding of the fire driven process of regrowth, a common second objective is to establish an understanding of the "natural" fire-induced process against which other, anthropogenic processes such as forest culling and replanting can be judged. The assumption is that such a comparison will permit the development of forestry techniques which closely mimic the "natural" impact of fire and, therefore, will assure the best regeneration process.

We think it evident from the above the fire paradigm is driving the search for explanations of processes in the boreal forest, and that this paradigm has all the components of the ancient phoenix myth—inherent decay requiring cleansing, a single focal cleansing agent, and renewal dependent upon cleansing. But is fire such a dominating process?

For a fire to traumatize the boreal forest it must go through three stages: ignition, continuous combustion, and spread. The ignition source in the vast majority of boreal forest fires is lightning, yet the ratio of ignitions to strikes is so low that other conditions must be responsible for fire location. These other factors are heat, dryness, and fuel availability. Heat alone can produce dryness, but maximum dryness is associated with desiccating winds which occur most commonly where sharp contrasts in surface heating exist. This condition occurs most frequently along the edges of forest stands where the full canopy decreases through an area of increased stem density to a treeless area.

To spread after ignition, the fire must have fuel, must be fed massive amounts of oxygen, and of course, must not be extinguished. Where are these circumstances most commonly found? The

optimum condition prevails where a relatively recent trauma has created a medium-sized opening in the forest canopy, i.e., an opening greater than 30 and less than 500 meters in width, and where the trauma has left dead trees along the forest edge. Such dry fuel is most available from medium-aged forests, where mortality has worked on a high adolescent stem density to produce a significant number of dead fallen and leaning trees. As the boreal forest grows and ages, it becomes damper, loses much of its "fuel-loading", and becomes more diverse as fallen trees create openings in which new growth occurs. It can be argued that the natural process in the forest both minimizes the effects of fire by achieving these fire retardant qualities of age, and works towards biodiversity through spot regeneration.

So what processes create enough edge effect for fires to ignite, burn, and create wide spread trauma? The resounding answer to this is—human caused trauma, and fire itself. In other words, for building and clearing create fire-prone edges which enable the high number of fires which in turn create more edges which create the conditions for more fires. If this evidence is viewed objectively, it might suggest that it has been human incursion into the boreal forest which encourages ignition and spread of fires, that the resulting fires themselves created the possibilities for further fires, and that continued human incursion encourages the maintenance of the fire cycle in the face of the forest's natural tendency towards fire suppression. Until such an hypothesis has been tested, any attempt based on data from historical fires to establish the existence of a fire cycle or a "natural fire return interval" is questionable. The application of sophisticated statistical techniques to provide a prediction of fire return may succeed only in discovering an artifact of the search itself and putting a

patina of numerical accuracy on a spurious set of numbers.

We would feel justified in speculating that the fire paradigm is malign if an examination of regeneration in the boreal forest organized to test the hypothesis we have put forward resulted in support for the existence of alternative ecological processes in the boreal forest. The current prevalence of the decay/cleansing by fire/regeneration hypothesis has had two impacts we find profoundly disturbing. The first is the espousal of the paradigm by forestry companies. For several decades now forest companies have defended their practices by claiming that they have an effect on the forest similar to that of a large-scale fire. The most disturbing aspect of this position is that as the fire paradigm has become more dominant, the public policies governing forest activity have tended to encourage forest removal and removal practices which are seen to mimic fire rather than re-

strict practices detrimental to the immediate maintenance of forest cover. Also, the prevalence of the paradigm has allowed both public and private suppliers of research funds to continue to justify self-serving research aimed at making forestry practices more closely resemble fire.

The second development which is particularly disturbing to us is that other analysts of the boreal forest, specifically those interested in wildlife, have begun to accept the fire paradigm as a given in explaining habitat change and species fluctuation and distribution. One close colleague in the wildlife area recently suggested that the future of wildlife diversity in Canada's boreal forest was dependent on finding a method of logging that closely mimicked fire! The authors of this paper were terrified by the fervour with which this ill-formed solution to a complex problem was supported.



Porcupine Hills, AB looking west.

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