

## **Fire in the Forest**

**Jim Saveland<sup>1</sup>**

Abstract.--From ancient philosophies to present day science, the ubiquity of change and the process of transformation are core concepts. The primary focus of a recent white paper on disturbance ecology is summed up by the Greek philosopher Heraclitus who stated, "Nothing is permanent but change." Disturbance processes, such as fire, provide a window into the emerging world of nonequilibrium theory. In contrast to a steady state view of the world, nonequilibrium theory asserts that biological communities are always recovering from the last disturbance. Disturbance is somewhat of a misnomer, connoting disruption of an equilibrium. Disturbance is about death and rebirth, the continuous process of renewal. Incorporating the process of renewal and transformation is the key to creating healthy forests and effective organizations. The process of continuous renewal in organizations is embodied in the concept of learning organizations. Building shared vision is one of the cornerstones of a learning organization and is the first step to incorporating disturbance ecology in land management practices.

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### **INTRODUCTION**

This setting for the 1995 National Silviculture Workshop, the Inn of the Mountain Gods, has a special meaning in the history of fire. Hominids first used fire some 1.4 million years ago. The primordial use of fire was not for heat or light, but for religious ceremony. According to Joseph Campbell (1972), fire may well have been the first enshrined divinity. Neolithic people acquired reliable fire-making techniques around 7000 BC. Since then, native peoples have touched virtually every corner of the world with their firesticks. Around the world, native people tell remarkably similar stories of how humans came to possess and use fire. The stories usually involve the theft of fire from mountain gods with the aid of a trickster/hero and a relay to pass fire from one to another (Campbell 1959). The trickster/hero has taken a variety of forms: for the Thompson river Indians of British Columbia, the trickster was Coyote; for the Creek Indians of Georgia and Alabama, Rabbit; for the Chilcotin, Raven; and for the Andamanese of the remote islands in the Bay of Bengal, Kingfisher. In Polynesia the trickster/hero was Maui, in many parts of Africa, Anansi, while for the Germanic tribes, it was Loki; and for the Greeks, Prometheus.

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<sup>1</sup>Fire Ecologist, Forest Fire & Atmospheric Sciences Research Staff, U.S. Department of Agriculture, Forest Service, Washington, D.C. Current address: Rocky Mountain Research Station, Fort Collins, CO.

In mythology, fire has often been linked with birds. My sole visual aid today depicts the phoenix (feng-huang in China), a universal symbol of death and rebirth, which is what disturbance ecology and hence this paper is all about.

Does anyone recall what the first national conference held by the Forest Service was about? The first national conference, the Mather Field Conference of 1921, arranged by Chief Greeley, was about fire. The decade preceding this conference was marked by the controversy between advocates of light burning and advocates of fire protection/suppression. Fire control and light burning were viewed as an either/or proposition. As a result of the Mather Field Conference, the protectionist policies formulated by Coert duBois, Stuart Show, and E.I. Kotok became dominant. Fire historian Stephen Pyne (1982) notes, "The intellectual and practical success of the conference marked the beginning of a national extension of systematic fire protection methods and the beginning of the end for light burning." Yet, light burning was never completely extinguished (Schiff 1962). As I look over the agenda for this workshop, I am hopeful that this national meeting will contribute to the resurrection of light burning and, thus, the integration of aesthetic and utilitarian doctrines. In the April 1920 issue of *Sunset* magazine then Chief of the Forest Service, Henry S. Graves, wrote "Torch in the Timber," an article denouncing light burning and advocating protectionist policies. Today, I present this paper, "Fire in the Forest," a testimonial to the fundamental importance of incorporating disturbance processes, such as fire, in our thinking and our management practices.

## **DISTURBANCE & FIRE**

The Directors of Forest Fire and Atmospheric Sciences Research, Fire and Aviation Management, Forest Pest Management, and Forest Insect and Disease Research recently chartered a team to develop a white paper on disturbance processes and ecosystem management. (The paper is available on Internet at the Forest Service home page site - <http://www.fs.fed.us/>). The intent of the white paper is to broaden awareness of the role and significance of disturbance in ecosystem dynamics and resource management. The primary focus of the paper is summed up by the words of the ancient Greek philosopher Heraclitus, "Nothing is permanent but change."

Heraclitus emphasized the connection between all things, including opposites. For him, fire was the primal element, the essential material uniting all things. Ancient China developed similar concepts embodied in the symbol of Yin and Yang. Yin and Yang express a cyclical theory of change, of becoming and dissolution and an interdependence between the world of nature and the events of man. Yin and Yang literally mean dark side and sunny side of a hill, which has definite implications to the way fires burn. Perhaps the ancient Chinese created the first symbol of disturbance ecology.

The white paper is not a state-of-the-art summary on disturbance ecology. Yet, the paper acknowledges the increasing importance of nonequilibrium theory in the science of ecology. Equilibrium theory has long dominated ecological thought and public policy. This theory asserts that systems are at equilibrium--in a steady state, with overall species composition and relative abundance stable through time--as a result of biotic interactions among its members. These systems return to their original structure after disturbance. The very word disturbance is

somewhat of a misnomer, connoting disruption of an equilibrium. Disturbance is about death and rebirth, the continuous process of renewal. Nonequilibrium theory asserts that biological communities are always recovering from the last disturbance (Reice 1994). Not only are all ecosystems (aquatic as well as terrestrial) disturbed, but most are disturbed frequently relative to the life history of the dominant species. Even apparently pristine, remote rainforests are often recovering from the last disturbance. Paleoecological data (pollen and phytoliths of *Zea mays*, and charcoal from grass fires found in lake/swamp sediment cores) from remote regions of seemingly untouched neotropical wildernesses demonstrate a 4,000 year history of human disturbance. (Bush and Colinvaux 1994).

Yes, disturbance is ubiquitous. For example, around the world, the dominance of pine and oak forests of virtually all species and in virtually all regions is due primarily to fire (Spurr and Barnes 1980). We often recognize the important role of fire in ponderosa and jeffrey pine forests in the West, longleaf and slash pine forests in the South, aspen and lodgepole pine forests in the Rocky Mountains, giant sequoia in the Sierra, redwood forests on the Pacific Coast, jack pine forests in the Lake States, dry sclerophyll forests in Australia, and savannas around the world. Yet, fire has also played a critical role in the development of areas we do not typically associate with fire: heathlands and moors of Western Europe and the British Isles, the mixed hardwood forest complex of the Eastern United States (particularly oak on dry sites), boreal forests of North America and Eurasia, taiga and tundra of the frozen North, and swamps, bogs, marshes, and prairies of the world. The consequences of failing to recognize the importance of disturbance processes can be dramatic. The highest mammal extinction rate in the world occurs in the spinifex grasslands of Australia where the fire regime has changed from frequent aboriginal burning to infrequent burning (Gill and Bradstock in press).

Nonequilibrium theory is also interwoven into the science of complexity and the study of complex adaptive systems, a collective designation for nonlinear systems defined by the interaction of large numbers of adaptive agents (Waldrop 1992). An ecosystem is a prime example of a complex adaptive system. Each ecosystem is a network of many agents (biological, chemical, physical) acting in parallel in an environment produced by its interactions with the other agents in the system. Agents are constantly acting and reacting to other agents; thus, change is constant. Complex adaptive systems are continually unfolding and in transition. To cope with constant change, developing optimum strategies becomes problematic. The most we can do is continuously improve. Prediction, feedback, and learning; i.e. adaptive management (Holling 1978, Lee 1993, Walters 1986, Walters and Holling 1990), are not optional, they are essential to developing strategies that work in an environment of constant change.

So the question becomes, how do we incorporate the ideas of disturbance and nonequilibrium theory into management practices. To find the answer, we must look at organizational development and its current focus on learning and transformation.

## **TRANSFORMATION & MANAGEMENT**

Just as disturbance processes are central to functional ecosystems, the process of renewal/transformation is central to functional organizations and may be the single most important challenge facing organizations today. Transformation is the result of learning. Consider the case of 3M. Two of 3M's core competencies are innovation and the ability to transform itself. Livio DeSimone, chairman and CEO, believes that 3M's philosophy is the fundamental reason the company can renew itself continuously: "Senior management's primary role is to create an internal environment in which people understand and value our way of operating.... Our job is one of creation and destruction - supporting individual initiative while breaking down bureaucracy and cynicism. It all depends on developing a personal trust relationship between those at the top and those at lower levels" (Bartlett and Ghoshal 1995). Creation and destruction...sounds a lot like disturbance ecology.

### **Shared Vision**

The process of continuous renewal in organizations is embodied in the concept of learning organizations (Argyris 1990, Argyris 1993, Argyris and Schon 1978, Senge 1990, Senge et. al. 1994). Building shared vision is one of the cornerstones of a learning organization and many authors have noted the importance of vision in all of today's organizations (Block 1986, 1993; Covey 1989, 1990; Covey, Merrill and Merrill 1994; Fritz 1984; Greenleaf 1970; Senge 1990; Senge et. al. 1994; Wheatley 1992).

I would like to take a minute to share my vision for the restoration of short-interval fire adapted ecosystems on National Forest lands. I see open stands of large pine trees (for example, longleaf pine in the Southern Coastal Plain, ponderosa pine in the West), lush native bunchgrasses and a carpet of wildflowers. There are clumps of regeneration. I smell the pine and wildflowers. I hear the birds - songbirds, hummingbirds, woodpeckers, and raptors. There is a great diversity of life especially in the understory. The midstory is sparse. If I look closely, I can see evidence of "no trace" logging. Fire is an integral part of this forest. So at times, I can feel the heat of the gentle fire and smell the smoke as it quietly disperses. Aldo Leopold (1949) defined land health as a vigorous state of self renewal. Here is a healthy forest, dynamic and changing. It has economic value (wood products, forage, recreation), biological diversity, and yes, aesthetic and spiritual value. It has utilitarian and aesthetic value, too often in conflict and seen as an either/or proposition in today's world. It is time to get off the utilitarian-aesthetic see-saw, for a lot of energy is spent on a see-saw going nowhere.

The purpose for sharing my vision with you is NOT to convince you to adopt my vision, although I suspect we have a lot in common. My purpose is twofold: first, to provide an example that illustrates the characteristics of a "well-formed" vision; and second, to emphasize the need to start building shared vision. It is not so much what the vision is, as what it does (Kiefer and Senge 1984). Vision catalyzes alignment wherein people operate as an integrated whole.

A well-formed vision has at least seven characteristics. First, it is an end result, not a process. Second, it is a desire, not an obligation. Third, it is specific. To state the obvious, a vision should be capable of being seen. Thus, the vision must be specific enough so you know it when

you see it. Fourth, it is not avoiding or ridding yourself of something unwanted. Fifth, it is not limited by what you think is possible. Sixth, it is in present tense. Seventh, it has nothing to do with being number one. Focus on good work, not on standings or recognition.

If you haven't gone through one of these exercises, you might take a couple of minutes now to begin the process. Relax, close your eyes if you wish, and get quiet. Ask yourself, "what do I really want?" Develop a picture that you can see. Does your vision contain the seven characteristics of a well-formed vision?

Building shared vision is not about top management going on a retreat to develop a vision statement and then selling it to the rest of the organization. Building shared vision is not a top-down process. It is a top-down and bottom-up process that is highly participatory. All individuals need to develop and share their own visions. The act of sharing brings about greater meaning, clarity, and alignment. So that is my vision, what's yours? And what are the public's visions of future forests? Developing the desired future condition in the forest planning process should include building shared vision with our partners and our adversaries. This is an extremely critical task, and we need to do a better job with it. For example, we could employ the techniques of dialogue (Isaacs 1993a, 1993b). As Margaret Wheatley states, "We need to be able to trust that something as simple as a clear core of values and vision, kept in motion through continuing dialogue, can lead to order" (Wheatley 1992).

Consider the experience of Shell Oil Company as described by Phillip Carroll, president and CEO:

"We began our transformation through a process designed to create a mission, vision, and values powerful enough to engage the minds and hearts of all 22,000 people in the corporation. The process - which is ongoing - encourages people to share their ideas about who we are, who we want to be, and where we fall short of those aspirations. The emerging dialogue from this process is producing a valuable dissonance that forces people to look deep within themselves and discover their personal visions for the company. This is important, since our transformation will not be complete until the personal visions of all our people converge into one collective vision." (Carroll 1995)

### **Current Reality**

To create effective change, an accurate description of current reality is needed in addition to a shared vision. The creative process (Fritz 1984) requires a vision of a desired result and a clear and honest view of current reality. The discrepancy between the two provides a tension that seeks resolution. That tension is the energy that enables creation. When developing vision and examining current reality, we must consider disturbance processes. Our information systems for assessing and reporting current reality need work. We currently have anecdotal reports on the loss of longleaf pine communities, the loss of ponderosa pine communities, the loss of aspen communities, and increasing stand densities (where once there were 20-25 trees per acre, there are now 800-1200 trees per acre). We do not have an annual report on the state of the health of the National Forests but we are working toward that end.

## CONCLUSION

Alvin Toffler calls these times of turbulent change, "the hinge of history" (Toffler 1990). Indeed, we have witnessed many paradigm shifts. In science we have gone from the age of Newton and an obsession with reductionism to the age of quantum mechanics, chaos, and complexity. In organizational development, we have seen a shift from Frederick Taylor's concept of "scientific management" to the ideas of "quality" (as expressed by Deming, Juran, Fiegenbaum, and others), and the "learning organization" (as expressed by Argyris, Senge, and others). In ecology, we have moved from the ideas of Clementsian succession and equilibrium theory to a recognition of the ecology of patch dynamics and the importance of disturbance-recovery regimes in nonequilibrium theory. Several consistent themes are inherent with each of these new ideas ushering in the Tofflers' (1994) third wave. Chief among them are: constant change, nonequilibrium, and continuous transformation through learning. At a fundamental level, disturbance in ecosystems and learning in organizations are closely linked by the concepts of death, rebirth, and transformation.

Finally, I'd like to spend a minute on the importance of core competencies to organizations, especially during times of change (Nevis et. al. 1995, Prahalad and Hamel 1990). After the Mather Field Conference, fire suppression became a core competency of the Forest Service. Chief Forester Henry Graves declared in 1913 that "the necessity of preventing losses from forest fires requires no discussion. It is the fundamental obligation of the Forest Service and takes precedence over all other duties and activities." Chief William Greeley's autobiography begins with recollections of the 1910 fires and the statement, "fire prevention is the No. 1 job of American foresters." He openly professed that he considered "smoke in the woods" as the yardstick of progress in American forestry (Pyne 1982). During these times of organizational change, it is important to re-examine, re-establish and foster our core competencies. I suggest that disturbance ecology in general and the use of prescribed fire in particular be considered core competencies of the agency. Prescribed fire is one of the most powerful tools available for the silviculturist, the range manager, the wildlife biologist, and the wilderness manager. Prescribed fire is desperately needed to restore the health of the long-needle forests and other fire-adapted communities.

Perhaps it is time once again to consider "smoke in the woods" as a primary yardstick of progress in American forestry. However, our challenge today is to increase the amount of prescribed fire (conservative estimates are by a factor of 10) while minimizing the negative impacts of smoke. Healthy, productive ecosystems and clean air are important to our society. We can do both.

And perhaps it is time to once again steal fire from the mountain gods and through a great relay, bring fire and the message of disturbance ecology back to the modern-day people of the world. And perhaps one day, the Phoenix will replace smokey bear as the defacto symbol of the Forest Service.

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