

# Committee on Resources

## Subcommittee on Forests & Forest Health

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### Statement

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### **Preventing Wildfires through Proper Management of the National Forests Oversight Hearing conducted by the House Subcommittee on Forests and Forest Health August 14, 2000, Albuquerque, New Mexico**

#### **Taking a Holistic Approach**

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Despite good intentions and billions of dollars in expenditures, our forests are continuing to deteriorate, as are the economies of forest-based communities. The increasingly combustible forests and this year's fires have brought this serious situation to a head, but the Forest Service is not alone in grappling with a deteriorating resource base. America enjoys the greatest concentration of scientists and wealth ever amassed in one nation and yet eroding soil is our greatest annual export. The weight and value of eroding soil annually exceeds all timber, beef, grain, consumer, industrial and military exports. Floods have become our leading weather-related cause of death. These facts should provide a wakeup call to any nation.

Other countries are faring no better, however, nor have they in the past. Many earlier civilizations succumbed to the same environmental degradation that threatens us now. After 40 years of informal field research conducted on four continents, I've come to the conclusion that the underlying cause of this age-old problem lies fundamentally in the way humans make decisions. Four key insights related to ecosystem function also play a role and must be understood before we can begin to see a turnaround. I've written a book on this subject, in collaboration with my wife, Jody Butterfield (*Holistic Management: A New Framework for Decision Making*, Island Press, 1999) and much of the background for my testimony can be found there.

At the outset, I feel I must declare my bias. I firmly believe that forests cannot be managed in isolation. They are so tied to the minds and culture of the people in the communities that surround them, to the economy of those communities and to health of the watersheds we all depend on, that only a holistic approach is likely to produce the desired results. Only an approach that treats humans, economies and the environment as one indivisible whole. This bias informs the evidence I give below, which I believe offers a constructive and inexpensive way forward.

### **Issues that Must Be Addressed**

There are four major areas of concern that I believe must be addressed before we can ensure the effective management of our forests, including the prevention of wildfires:

1. The lack of understanding of the importance of the decay process in living communities, and how

this process is suppressed in the seasonally-humid, or "brittle," environments that cover most of the western states, resulting in increasingly drier and more combustible forests and rangelands.

2. The conflict between the various user groups and the government agencies over *how* the forests should be managed, without first determining *what* they ultimately want to achieve. Most discussions revolve around what people *don't* want.
3. Many forest management plans are economically unsound in that they cost more to implement than they yield in revenue. Forest management should make, rather than cost, money. Forest management should benefit rural communities, rather than diminish them, and above all, forest management should account for the costs we refer to today as "externalities"--the social costs of failing, forest-based economies and communities, the environmental costs of damaged watersheds, streams, rivers, seashores, fish and wildlife.
4. The challenge we face in introducing new ideas into democratic bureaucracies--whether they exist in government, academic, or private institutions--within a realistic time frame.

## 1. The Importance of Decay

When the basic life cycle--birth, growth, death and decay--within a community of organisms is disrupted at any point, ecosystem function is impaired. We are currently experiencing a massive disruption in this cycle over much of the Western States where precipitation and humidity are seasonal. The breakdown of plant material no longer occurs mainly through biological decay, but through chemical (oxidation) or physical (weathering) processes. This shift, which has been ongoing for centuries, but exacerbated more recently by our management, has led to ever drier and more combustible rangelands and forests. It has also led to invasions of noxious weeds and woody vegetation, the loss of biodiversity, and increasingly severe and frequent droughts and floods.

### ***Brittle and Nonbrittle Environments***

To understand why this shift has occurred, one first needs to know something about the differences in brittle and nonbrittle environments. All environments fall somewhere along a continuum that spans from the perennially humid, or *nonbrittle*, environments (tropical jungle) to the seasonally-humid *brittle* environments (true desert). Total precipitation does not influence the degree of brittleness as much as the pattern of the precipitation. Elevation, winds, slope and angle of the sun, and temperature also affect the daily humidity in the soil, litter, vegetation and atmosphere. Forests, like any other environment, fall at various points along this continuum, or "brittleness scale." Given a range of one to ten, perennially-humid forests would be at 1 on the scale, while tropical deciduous teak forests, which average 30 to 40 inches of rain, but over a very short season, would fall at the very brittle end, at about 8. Most of the western forests and the grasslands surrounding and interspersed with them lie around the middle to high end of the brittleness scale (3 to 8). This brittleness factor is critical because it can affect the decay process dramatically.

While scientists have studied the birth, growth and death of many species, few have looked seriously at the decay of plant species in the seasonally-humid, brittle environments. Decay is a biological process brought about by billions of small creatures and microorganisms. Without adequate micro-life, plant material can only break down in one of two ways: through chemical oxidation--the same process that causes rust to form on old metal, but turns plants gray rather than red; or physical weathering--wind, rain or hail that breaks off

the oxidizing material. Where biological decay is a rapid process (taking days or months) and prevents an excessive accumulation of material, oxidation and weathering are gradual processes (taking many years) that lead to a tremendous accumulation of highly combustible material.

### ***What We Have Lost***

So why has a shift occurred from biological decay to mainly chemical and physical breakdown in the brittle environments? In short, because these environments are no longer intact. In all environments, the soils, plants, and animals co-evolved and function as a whole. Each serves as food for the other at some point in the life cycle of any biological community. The plants capture sunlight energy and convert it to edible form; animals eat the plants; other animals eat the animals, and so on until microorganisms consume the last of the energy.

In nonbrittle environments, the animals, or herbivores, consuming the bulk of the plants are mainly insects. Because humidity remains high throughout the year, their populations, and those of the decomposing microorganisms, remain high throughout the year. Any vegetation that is not consumed by insects, or by the relatively low populations of mammals that also occur in these environments, is quickly broken down through biological decay.

In brittle environments, the main herbivores are large mammals. The significance of this is great indeed as a high proportion of the plant material dies off every year during the dry or dormant period. This die-off of plant material coincides with the die-off or dormancy of the insect and microorganism populations necessary for decay. Because large herbivores are unable to digest coarse plant material they have, over millions of years, developed a symbiotic relationship with vast populations of microorganisms that survive the dormant period in the moist environment of the animals' digestive tracts. It was this relationship that helped to maintain the decay process and prevented the massive build up of combustible material from year to year. These animals once occurred in vast herds in the world's brittle environments, but have been reduced to pathetically few in number. Thus, these environments are no longer intact and the level of their deterioration reflects this.

Modern-day environmentalists often insist that large herds of herbivores didn't occur in many parts of the American West. But they are only considering relatively recent times. Up until approximately 11,000 years ago, North America, including the West, more closely resembled the Serengeti Plains of East Africa. Not only were the herds immense, but the diversity of herbivore species, and the predators that followed them, was breathtaking. Following the arrival of skilled human hunters some 12,000 years ago, 74% of our large mammal *genera*, which had evolved symbiotically with this continent's plants and soils over a 100-million-year period, suddenly became extinct. Clearly, the numbers of animals recorded by early European travelers to North America were but a remnant of former times. In recent centuries even those populations have largely disappeared.

### ***The Land Dries Out***

Most species of the soil-stabilizing perennial grasses, having co-evolved with large, severe-grazing animals, have growth points for new leaf and stem at ground level, out of harm's way. Unfortunately, if the leaves and stems of each year are not removed, the old oxidizing material can accumulate to the point that it kills the plant by denying light to the growth points. Commonly, the death and disappearance of these grasses is blamed erroneously on overgrazing.

Healthy perennial grasslands surrounding and within the forest community are important for keeping soil covered and, thus, sustaining an effective water cycle in which little or no water runs off and water loss to evaporation is minimized. When brittle-environment forests, or rangelands, support insufficient numbers of large herbivores, most of the perennial grasses that evolved with high animal numbers die out, as they are dependent on severe grazing for their survival. Such areas are, in effect, being rested to death.

Government agency research plots, from which large herbivores have been excluded for 40 to 60 years or more, exist over most western states. All of these plots reflect the deterioration that occurs when land in brittle environments is rested; the lower the rainfall, the more severe the deterioration. Most of the perennial grasses are gone, save for gray, oxidizing remnants, having been replaced by weeds or brush. In one BLM plot in California, 100% of the perennial grasses are dead, but after more than 40 years, the gray clumps have not yet broken down.

As plants die prematurely and oxidation replaces decay, not only does the amount of combustible material increase, but also the percentage of bare soil between plants. On most of the government plots I have visited, between 80% and 95% of the soil is exposed. In every case, the situation is little better outside the enclosures, where pathetically few livestock graze.

This high degree of bare soil, at best covered with algae and lichens, results, according to one study by the Desert Research Institute in Namibia, in up to 83% of any moisture that does penetrate being subsequently lost through surface evaporation. It is this surface evaporation (of water that has already penetrated soils) that results in the increasing frequency and severity of droughts, the depletion of underground water supplies (even where no pumping takes place), the drying up of springs, and the loss of perennially-flowing rivers.

On sloping land, during periods of high precipitation or rapid snowmelt, the increase in bare soil leads to increased water runoff and flash flooding, causing not only great damage but also the loss of enormous quantities of water. This drying out of the land also means that the microenvironment around the old oxidizing plant material is drier than it should be. A tinderbox has been created that only awaits igniting by humans or lightning.

### ***Woody Plants and Noxious Weeds Invade***

Healthy perennial grasslands also offer the greatest protection against a shift to more combustible woody shrubs and weeds. The gradual oxidation and weathering of the old material that chokes most perennial grasses also kills their fibrous root systems. This dead root zone provides an ideal environment for the establishment of weeds, brush and trees, which, once their seeds have germinated, must get their tap roots down to soil nutrients if they are to thrive. As these herbaceous or woody plants increase in number and begin to dominate the landscape, they are commonly proclaimed to be "noxious" (whether they are native or non-native species). This in turn leads each State to annually waste many millions of dollars in futile chemical and mechanical control or the use of "prescribed burns."

None of these measures succeed long-term simply because the underlying cause of the shift away from a healthy perennial grass understory to oxidizing grasses, weeds and brush is not addressed.

### ***Addressing the Underlying Cause***

To date we have attempted to manage rangelands and forests with a limited set of tools, which fall into four categories:

*Technology--from the simplest axe to the most sophisticated machinery and chemicals*

*Fire--in the form of prescribed burns*

*Rest--from any form of disturbance (fire, grazing/trampling)*

*Living Organisms--through the release of organisms that will prey on or inhibit the spread of organisms that have become pests.*

While these tools have produced some success, particularly technology in the thinning of solid forest stands, the land, overall, has continued to deteriorate. The reason why is simply because none of these tools can restore decay as the fundamental process used to break down the mass of annually dying plant material.

Clearly, we need to recognize that only large herbivores, functioning as they once did in large herds, can do this. Unfortunately, apart from Alaska, North America no longer has large herds of wild herbivores. This leaves us having to use livestock as the only "tool" available to us that can do the job. But it immediately raises the question of how we can prevent the overgrazing and overtrampling that are so often associated with livestock.

### *Using Livestock as a Tool*

Overgrazing is commonly believed to be due to too many animals, but this is a myth and one that has been extremely difficult to dispel. Most of the regulations governing livestock grazing are based on it, and so is most of our management. So ingrained is our belief in this myth that we do not ask for an Environmental Impact Statement when a suggestion is made that livestock be removed altogether from a public land area because we are so sure the land can only improve--*as it will no longer be overgrazed*. However, as you are now aware, many perennial grasses will actually begin to die for lack of grazing if the environment is brittle to any degree.

Back in the 1950s a French scientist, André Voisin, established that overgrazing bore little relationship to the number of animals but rather to the *time* plants are exposed to the animals. If animals remain in any one place for too long or if they return to it before plants have recovered, they overgraze plants. Damage from trampling is also related to time. Trampling does good when it pushes old, oxidizing material to the ground, or when it aerates the soil by breaking sealed surfaces, but it does damage if prolonged too much or repeated too soon.

Building on Voisin's research, I was able, with the help of thousands of collaborators on four continents, to perfect a planning procedure that enables us to run livestock in large herds without overgrazing plants or pulverizing soil, and in situations of enormous complexity. The needs of wildlife are catered for, as are the requirements of multiple land users and uses. So are the needs of the livestock producer who, while restoring degraded land to health, must do so profitably. This procedure, known as Holistic Management™ Grazing Planning, has been in use for over 30 years and has enabled us to reverse the processes that have led to the drying out of the land.

Ranchers, farmers, foresters and others in all of the western states and elsewhere in the U.S. are beginning to use livestock as a tool for land reclamation and fire prevention with the help of this planning procedure. In the last decade many of the "good stewardship" awards given in the U.S. have gone to these people (and the same goes for their counterparts in Mexico, Canada, Australia and Southern Africa.).

The possibilities opened up by viewing livestock as a tool are endless. We can now create firebreaks simply by concentrating the animals on areas we would formerly have burned or mechanically graded, at little or no cost, and with no risk of soil exposure or runaway fires. We can use them to reduce noxious weeds and heavy brush, to break down the steep cutting sides of arroyos so they can begin to heal, or to get grass growing once again on patches of bare ground. We can't do any of this effectively, however, without the planning procedure that enables us to get the animals to the right place, at the right time, and for the right reasons.

One of the major problems that bedevil foresters, following a fire or the clearcutting of an area, can be the massive invasion of tree seedlings (3,000 and more per acre). Unless thinned, such stands greatly increase fire risk, interfere with water reaching the soil surface, and impede quality growth. Harvesting of small diameter timber helps, but very dense stands are problematic both to harvest and to market. Once again, given the planning procedure we now have, livestock can be used to thin these dense stands, or to prevent them from developing, if allowed to graze and trample the area over a short but crucial time.

### ***More Than a Grazing Plan is Needed***

Holistic Management involves much more than grazing planning. At its center is a new decision-making framework that is used by land managers to help them determine what "tool"--technology, fire, livestock, etc.--or action is most appropriate in any setting at any time. No one action can ever be right in all situations or even in all years in the same situation. The Holistic Management™ decision-making process not only assists managers to determine what action is best at any point, it also suggests different combinations--selective logging or fire followed by grazing, for example. And, always, any action or combination of actions is "tested," using what we refer to as a *holistic* goal as our reference point, for its social, economic and environmental soundness, both short and long term, in that particular situation. Once we implement the action(s), we assume we still might be wrong, despite having tested the idea, and we monitor for the earliest signs of warning.

When people use this process we generally find they experience the following relatively quickly:

- Greater harmony among the people involved;
- Increased profitability (over 300% among ranchers and farmers in one group studied by Ohio State University);
- Land improvement--an increase in the amount of material decayed, bare ground beginning to close up, greater volume of forage produced, increase in the diversity and numbers of the resident wildlife.

The greatest strengths of the Holistic Management™ framework are that it caters for the uniqueness of every situation and the people within it, and that it is based on the notion that people will always act in their own self-interest. It is used as a decision making and management *process*. It is not in any way prescriptive.

## **2. Eliminating the Conflict**

Most people (and governments) want to be prosperous, to have stable communities and families, less violence and more security, the right to pursue their own spiritual beliefs, clean, healthy food, air and water, aesthetic surroundings and abundant wildlife. However, we rarely discuss these mutual desires, nor steer our management so we can achieve them. Rather, we indulge in endless arguments over which actions to take,

or which tools to use--prescribed fire versus natural fire, cattle versus rest, recreation versus timber extraction--basing our views mainly on what we don't want. This has to change.

Few forests are used solely for timber production. Seasonal grazing is also a common use, as is recreation, in the form of hunting, hiking, fishing, biking and so on. As valuable as these uses are to the users themselves and to the local economy, they pale in comparison to the service forests provide as catchments for the water that agriculture, industry and cities depend upon. We have to ensure through our management that none of these uses diminish the forest's ability to perform this service.

Where we get into trouble is when we develop a management plan based on a single objective, particularly one that is problem-oriented, such as "to prevent wildfires," "to reduce soil erosion," and so on. The plan's orientation needs to be toward what we hope to achieve in a much larger context, well beyond the problem. When based on single, or even multiple objectives, plans never do account for the complexity inherent in any management situation, and particularly in multiple-use forests. Conflict and litigation are inevitable and the resource base continues to deteriorate.

### ***A Way Forward***

Holistic Management addresses all these challenges by first having the people responsible for management form what we refer to as a *holistic goal*. In it they describe the quality of life they collectively seek in terms of the entity they are managing, what they have to produce to create that quality of life, and a description of the resource base they depend upon *as it will have to be*, far into the future, to sustain what they must produce to create the quality of life they envision.

All the decisions they make in planning how to reach the holistic goal, or in addressing problems or opportunities that arise along the way, are evaluated according to the same criteria they have always used. In addition, however, they finally ask seven simple questions to ensure their decisions are socially, environmentally and economically sound *and will lead them toward the holistic goal*.

In other words, any action taken to deal with a problem, to reach an objective, or to meet a basic need, should accomplish what is required, but should also enhance progress toward the holistic goal. To ensure that this happens, a feedback loop is established so that if monitoring shows the decision is not taking you where you want to go, you can act immediately to correct it.

In case after case, this process has enabled former foes to come together in the interest of achieving what they all want. There are still arguments, to be sure, but they can now be settled based not on *who* is right, but on *what* is right for that particular situation at that particular time.

In the words of Paonia (Colorado) Ranger District range conservationist David Bradford, "The Paonia Ranger District and the permittees would be happy to give a tour of the West Elk allotment to anyone who still doubts that Holistic Management can produce the best resource management in our National Forests."

### **3. Toward Economic Soundness**

Forest management should result in earnings that are greater than expenditures. This seldom happens, and probably never would if "external" costs were figured as an expense. Take, for example, the amount generally budgeted for a prescribed burn. Federal and state land managers figure the cost at \$3 per acre, which covers the person lighting the match, the crew to guard the perimeter, and the insurance in case it

gets out of hand. What is not included is the forage lost for both livestock and wildlife, lost nesting and fawning areas, wood that could be made into a product and the jobs that this might produce, the soil exposure, which reduces the effectiveness of the water cycle through increased runoff and flooding, which in turn can lead to loss of life. Yet, all of these costs are real and eventually have to be covered by increased taxes and insurance rates.

We have developed a financial planning process that *does* enable people to cater for all these costs, mainly by ensuring they are not incurred in the first place. In forming their holistic goal, most people list "prosperity" as essential to their quality of life. When they then list what they have to produce to achieve it, they don't talk of increasing the quantity or output of what they produce, but rather, "profit" from what they produce. This is an important distinction. Profit, rather than increased production is the goal, and the actions you take to achieve that profit are tested to ensure the goal is reached in the most economically, environmentally and socially sound way. When planning in the conventional manner, increased production is commonly the goal and budgeting tests its profitability. This never caters for externalities.

Holistic Management™ Financial Planning has enabled hundreds of users to become far more profitable than ever before while at the same time increasing biological capital that not only sustains them but our nation as a whole. Yet, this planning is not something that government agencies have been able to even attempt, given the bureaucratic structures they operate within. And that brings me to the final area of concern I want to address.

#### **4. Penetrating the Bureaucracy**

Research and experience show that while democratic bureaucracies are sometimes quick to adopt the latest ideas, particularly those related to technologies within the prevailing paradigm, they are almost watertight to new ideas outside the prevailing paradigm. Britain's Royal Navy, although headed by brilliant men, took 200 years to accept the idea that lemon juice could cure scurvy after it was first demonstrated in 1601. Hundreds of thousands of sailors died in the meantime. The Merchant Navy, which worked closely with the Royal Navy, and was also headed by brilliant men, took a further 70 years.

Bureaucracies function no differently today than they did in the 17<sup>th</sup> Century. Take, for example, the idea first proposed by André Voisin, and backed by exhaustive research, that overgrazing is related to *time* rather than animal *numbers*. Because it is not in line with the prevailing paradigm, it still awaits institutional acceptance. No university, livestock organization, environmental organization or government agency that I'm aware of promotes the idea, although hundreds of individuals within these institutions have not only accepted it as fact, but demonstrated it in practice. Many of the ranchers, farmers, environmentalists, and government agency staffers who have trained with us have tried in vain to practice Holistic Management in public land settings only to be thwarted by policies and regulations that stop them at every turn.

No one is to blame for this frustrating state of affairs. The research on how bureaucracies function indicates this has been the norm since Voltaire's time, when government and institutional bureaucracies rose to become the dominant organizational form. Within the Forest Service, Holistic Management has gained a tenuous foothold in a few ranger districts, but only because of the diligent efforts of a few overworked agency staff who get little support from higher up. Elsewhere, the pleas of permittees who want to give it a go fall on deaf ears. But that works the other way too. Sometimes it's an agency staff member who has the knowledge and the eagerness to get started, but finds the permittees lack the knowledge, and thus the enthusiasm.



We can't afford to bypass the bureaucracies, particularly government bureaucracies because we are bound by the policies and regulations they set. If we are to get new knowledge generally accepted within the Forest Service, as well as within American environmental and livestock organizations, then I only see two alternatives before us. The first reflects the course we've almost always taken. The second is something I proposed to senior Forest Service staff when I met with them in Washington a year ago, and on which they are currently acting:

1. We can continue at the slow pace we are moving, accepting that the situation will continue to worsen--land will continue to deteriorate, and expenditures, conflict and litigation to increase--while new knowledge gradually filters through the minefield of peer pressure, fear, and institutional and personal egos, until massive grassroots support demands change. British researcher Lord Eric Ashby, who studied 200 years of British and American history to determine how new knowledge enters democratic societies, concluded that only at this point is it safe for leaders in a democratic society to lead the change and for institutions to adopt new practices.

Or,

2. Establish a "national learning site." This would entail selecting a large area of deteriorating

land administered by the Forest Service and other agencies that would be managed holistically in collaboration with representatives from the government agencies, national livestock and environmental organizations, and the local community. All of these people would express their desires related to the site in the holistic goal they form together. Then a smaller group would be charged with managing the site, using all the knowledge available to them, but testing to ensure that any actions they take are socially, environmentally and economically sound and will lead them toward the holistic goal. I have no doubt that in this process the managers will find a number of regulations prevent them from implementing the decisions necessary to achieve the holistic goal. These regulations will have to be waived.

Based on what we learn from such collaboration, it is just possible that new knowledge could be spread throughout our bureaucracies in less than the 100 or so years it normally takes.

Negotiations are nearing completion for the establishment of a national learning site to be based in the Lost River Valley (Salmon/Challis National Forest) of Idaho, but we still face a number of challenges. The Forest Service and local permittees are already committed and involved, as is the local community, but we have still to gain commitment from other agencies (BLM and NRCS) operating in the area, and from representatives of the national environmental and livestock organizations we must involve. We also have yet to secure adequate funding. Most importantly, we lack the full support of Congress, which will be essential if this learning site is to remain viable through any political changes over the next five years.

It would, I believe, be a wise investment to eventually establish collaborative learning sites in every Western State. The cost of fully funding and supporting such sites would amount to a few million dollars--far less than we've spent fighting fires this year.

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